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ERRATA.

Page 74 line 33 for " (again at the rate of $\frac{1}{4}$ oz. to each plant) " read " (at the rate of 2 oz. per square yard) "
,, 110 for lines 26–28 substitute "were 2 per cent. sprays of lead arsenate, sodium fluoride or barium chloride, or 2 per mille sprays of Paris green; and dusts of pure calcium arsenate, of barium fluoride, either pure or mixed with equal parts of lime, or of lead arsenite mixed with 5 parts lime."
,, 121 line 34 for "*Myriangum*" read "*Myriangium*"
,, 128 ,, 2 ,, "*M. spermatotrophus*" read "*M. spermotrophus*"
,, 138 ,, 30 ,, "*Leptocoris*" read "*Leptocorisa*"
,, 147 ,, 50 ,, "*absinthum*" read "*absinthium*"
,, 191 ,, 3 ,, "Dr. Staineur" read "Dr. P. Staner"
,, 199 ,, 36 ,, "*Hansiella*" read "*Hanseniella*"
,, 200 ,, 17 ,, "weeks" read "days"
,, 239 ,, 31 ,, "664" read "434"
,, 251 lines 11 and 17 for "*Glossita*" read "*Glossista*"
,, 277 line 25 for "QUILLIS PEREZ" read "QUILIS PEREZ"
,, 281 ,, 24 and page 283 lines 12 and 41 for "*Rev.*" read "*Rep.*"
,, 325 ,, 43 for "1929–30" read "1928–29" and for "following spring" read "spring of 1930"
,, 377 ,, 9 ,, "*talicida*" read "*talidicida*"
,, 397 two lines from end for "*Mellisoblaptes*" read "*Melissoblaptes*"
,, 413 line 17 for "*phillippiae*" read "*philippiae*"
,, 446 ,, 35 ,, "*Thialella*" read "*Thiallela*"
,, 456 ,, 21 ,, "GOUX (W.)" read "GOUX (L.)"
,, 498 ,, 22 ,, "*Prosalidus rufus*, Hust." read "*Prosaldius rufus*, Hust. (M.S.)"
,, 518 " 26 ,, "xviii" read "xvii"
,, 535 lines 19 and 34 for "*opuntia*" read "*opuntiae*"
,, 563 line 2 for "*P. brassicae*" read "*B. brassicae*"
,, 573 ,, 22 ,, "xix" read "xviii"
,, 575 ,, 8 ,, "*philippiensis*" read "*philippinensis*"
,, 622 ,, 19 ,, "*P. oleae*" read "*L. oleae*"
,; 691 ,, 48 after "investigation" insert "in Arizona"
,, 705 ,, 1 for "CANDURA (G. A.)" read "CANDURA (G. S.)"
,, 720 ,, 30 ,, "1,315,200" read "$6\frac{1}{2}$ millions"
,, 737 ,, 13 ,, "B" read "A"

IMPERIAL INSTITUTE OF ENTOMOLOGY.

REVIEW

OF

APPLIED ENTOMOLOGY.

SERIES A.

Vol. XIX.] [1931.

MARSHALL (Sir G. A. K.). **New Curculionidae, with Notes on Synonymy.** —*Ann. Mag. Nat. Hist.*, (10) vi, no. 35, pp. 551–577, 3 figs. London, November 1930.

Among the species dealt with are *Lophobaris piperis*, sp. n., an important pest of pepper (*Piper nigrum*) and widely distributed in Sumatra and Java; *Cholus spinipes*, F. (*wattsi*, Mshl. [*R.A.E.*, A, x, 391]); and *Heilipus trifasciatus*, F. (*perseae*, Barber [ix, 91]). The genus *Mimaulodes*, Mshl., which includes the species *hirtulus*, Mshl., and *fimbriatus*, Mshl., is synonymous with *Aedophronus*, Schh.

ADKIN (R.). *Tortrix viridana* **bred from** *Quercus ilex.*—*Entomologist*, lxiii, no. 811, p. 284. London, December 1930.

Tortrix viridana, L., was bred from larvae feeding on *Quercus ilex* (evergreen oak) in Sussex, together with a Braconid, probably *Meteorus ictericus*, Nees.

POTTER (C.). **A new Moth introduced into England:** *Mussidia nigrivenella* **Ragonot (Phycitidae).**—*Ent. Mon. Mag.*, lxvi, no. 798, p. 258. London, November 1930.

One adult of the Pyralid, *Mussidia nigrivenella*, Rag., has been obtained in a London warehouse in stored cacao from West Africa, where it has previously been recorded from cacao, etc.

RICHARDS (O. W.). **A Proctotrupid bred from a Syrphid Pupa.**—*Ent. Mon. Mag.*, lxvi, no. 799, pp. 277–278. London, December 1930.

Trichosteresis försteri, Kieff., was bred from a Syrphid pupa in Buckinghamshire. Though this Calliceratid has previously been recorded as a parasite of *Capitophorus* (*Aphis*) *ribis*, L., it was probably parasitising a Syrphid associated with the Aphid, particularly as another species, *T. syrphi*, Bch., has also been bred from Syrphid larvae.

Massee (A. M.). **The Apple Blossom Weevil: The Results of further Investigations upon its Control.**—*Rep. E. Malling Res. Sta. 1929,* xvii, pt. 1, pp. 89–93, 2 refs. East Malling, Kent, April 1930.

An account is given of the banding experiments carried out in 1929 against *Anthonomus pomorum*, L. [*R.A.E.*, A, xviii, 503]. During seasons when the amount of apple and pear blossom is exceptionally large, the larvae might only reduce it to the extent of obviating the necessity of hand-thinning the fruit; but during an average season they are serious pests [*cf.* xviii, 628]. As the first essential is to produce a good crop, attempts should be made to control the weevil even though thinning might prove necessary after the June crop.

Listo (J.). **Omenanlehtikirppu** (*Psylla mali* **Schmidb.**). [The Apple Psyllid, *P. mali.*]—*Valtion Maatalouskoetoiminnan Tiedonantoja* [*Bull. Govt. Agric. Res.*], no. 17, 11 pp., 10 figs. Helsingfors, 1930.

A brief account is given of the bionomics and distribution of *Psylla mali*, Schmidb., which is very injurious to apples in Finland. Winter spraying with fruit-tree carbolineum has proved to be the best method of control. Summer sprays of nicotine, quassia or Volck oil are also recommended.

Roepke (W.). **Verdere gegevens omtrent de iepenziekte en den iepen-spintkever.** [Further Data on the Elm Disease and the Elm Cambium Beetles.]—*Tijdschr. PlZiekt.*, xxxvi, no. 9, pp. 232–237, 2 pls. Wageningen, September 1930.

Further observations, made in Holland, on the relation of *Scolytus scolytus*, F., to *Graphium ulmi*, the fungus thought to cause Dutch elm disease, confirm those already noticed [*R.A.E.*, A, xviii, 177, 697].

Bruneteau (J.). **La mouche de l'oeillet,** *Hylemyia brunnescens*, **Zetterstedt.**—*Rev. Zool. agric. appl.*, xxix, no. 3, pp. 37–46, 1 pl., 11 figs., 16 refs. Bordeaux, March 1930.

Keys are given to the males and females of the three carnation flies, *Hylemyia cardui*, Mg., *H. fugax*, Mg., and *H. brunnescens*, Zett., and the last-named, the larva, pupa and adult of which are described, is recorded as doing considerable damage to carnations near Rouen, both in greenhouses and in the open. It is found in the adult stage in gardens from spring until autumn, individuals living from 4 to 8 days in the laboratory. There are two ill-defined generations in a year, oviposition occurring at the beginning and end of the summer; in greenhouses there may possibly be three. Eggs are generally deposited singly on the upper surface of the leaf, and in about 10 days the larva hatches and mines in the parenchyma, a blister generally forming near the point of entry. The leaf quickly dries, and the larva then burrows into the stem where it eats out the pith. The plant gradually dies and the leaves fall. Pupation occurs within the gallery or just under the surface of the ground. The winter is passed in the pupal stage, emergence beginning towards the end of March. All species of *Dianthus* are attacked, particularly *D. caryophyllus* (carnation); the lower-growing varieties seem to be preferred. Suggested methods of control, which include

the use of repellents for preventing oviposition, are briefly discussed. The best remedy is to burn all infested plants and sift the soil of the pots for pupae. In the open, the soil should be fumigated in winter with carbon bisulphide and well broken up before planting in the spring. *Lychnis*, which is an alternative food-plant, and *Dianthus* growing near plantations should be pulled up.

FAES (H.). **Station fédérale d'essais viticoles à Lausanne et Domaine de Pully. Rapport annuel 1929.**—*Annu. Agric. Suisse*, xxxi, no. 3, pp. 287–318. Berne, 1930.

Most of the work done on vine and orchard pests has been noticed from another source [*R.A.E.*, A, xviii, 604]. The situation with regard to *Phylloxera* in the Cantons of Vaud and Valais is summarised.

Notes are given on the bionomics of *Bruchus* (*Acanthoscelides*) *obtectus*, Say, which has recently appeared in Switzerland, having doubtless been introduced from France. It is almost impossible to control in field beans, but in storage should be dealt with by fumigation with carbon bisulphide or chloropicrin or by heat treatment. *Pyrausta nubilalis*, Hb., has been observed attacking cultivated chrysanthemums.

A list of the chief pests and diseases of cultivated plants dealt with during 1929 is given.

BARBEY (A.). **Les insectes ravageurs du pinsapo** (*Abies pinsapo* **Boiss.**). —*Bull. Soc. vaud. Sci. nat.*, lvii, no. 225, pp. 223–224. Lausanne, 10th September 1930.

Of the insects recorded, the only one of importance is the Pyralid, *Dioryctria aulloi*, Barbey, which feeds on the terminal buds of *Abies pinsapo* in Andalusia and of *A. numidica* in Algeria [*cf. R.A.E.*, A, xviii, 179, 368].

[SHCHEGOLEV (V.) & STRUKOVA (M.).] **Щеголев (В.) и Струкова (М.). Pests of Oil-producing cultivated Plants.** [*In Russian.*]—Demy 8vo, 216 pp., 116 figs., 124 refs. Moscow, Gosud. sel'skokhoz. Izd., 1930. Price *Rbl.* 2.

This handbook on insect pests of oil-producing plants in the Russian Union is based partly on the literature and partly on observations in the North Caucasus. It includes a key to the pests and a tabulated list showing the food-plants attacked by each. Notes are also given on their bionomics and control, a separate chapter dealing with remedial measures.

[VASIL'EV (I.).] **Васильев (И.). A Contribution to the Question of the Resistance of** *Phylloxera* **to Winter Cold.** [*In Russian.*]—*Visn. Sadiv. Vinogr. Gorodn.*, vi, no. 4–5, pp. 175–177, 1 ref. Kharkov, 1930.

Observations in 1929 indicated that in the Ukraine breeding and hibernation of the root form of *Phylloxera* chiefly occur at a depth of from 10 to 18 ins. in the soil [*cf. R.A.E.*, A, xvii, 689]. All the hibernating larvae that occurred at this depth were killed during the severe snowless winter of 1928–29, when the soil was frozen to a depth of 20–24 ins., and

the temperature at a depth of 10–18 ins. was between 0 and —5° C. [32–23° F.]. At a depth of 18–24 ins., 30–50 per cent. were killed, but those below this level survived. Reproduction did not begin until the middle of June, when eggs were laid at a depth of 16–18 ins., the upper layers of the soil only becoming infested towards the end of July. As a result there were only four generations during the season instead of the usual five. It is probable that 80–90 per cent. of the hibernating root form may be killed by the cold in snowless winters, though many of the vines are also killed. In the case of the leaf form, the hibernating eggs can resist temperatures as low as —30° C. [—22° F.].

[Arkhangel'skiĭ (N. N.).] **Архангельский (Н. Н.). Materialien zum Studium der Desinsektionseigenschaften gasförmiger Giftstoffe.** [The disinfectant Properties of gaseous poisonous Substances. (*In Russian.*)]—*Bull. N. Caucas. Pl. Prot. Sta.*, v, pp. 3–44, 20 figs., 1 diag., 4 refs. Rostov-on-Don, 1930. (With a Summary in German.)

An account is given of laboratory experiments, carried out in 1926 in Rostov-on-Don, to compare carbon bisulphide (CS_2) and chloropicrin (CCl_3NO_2) as fumigants for pests of stored products, particularly *Calandra granaria*, L. A parallel experiment showed that sudden changes in temperature are fatal to this weevil ; exposure in the grain for 24 hours to a temperature of −3° C. [26·6° F.] after 10° C. [50° F.], and then again to 13° C. [55·4° F.] killed 66 per cent. in 10 days.

The susceptibility of the various pests to the two fumigants, which varied widely, is shown in graphs ; *Tribolium confusum*, Duv., and *Laemophloeus testaceus*, F., were the most resistant, the more susceptible species in order of resistance being *Tyroglyphus* sp., the eggs of *Ephestia kühniella*, Zell., and *Plodia interpunctella*, Hb., *Calandra oryzae*, L., *Sitodrepa panicea*, L., *C. granaria*, *Tenebroides mauritanicus*, L., and *Silvanus surinamensis*, L.

The minimum fatal dosages for the various species at temperatures of 21–22° C. [69·8–71·6° F.] and an exposure of 8 hours in empty granaries are shown in diagrams ; all the species were killed with 95 oz. carbon bisulphide or 8·95 oz. chloropicrin to 1,000 cu. ft., accelerated evaporation being necessary in the case of the latter.

Low temperatures necessitate larger quantities of the fumigant, but the relation of these two factors is irregular, and when the amount of the fumigant is decreased and the exposure prolonged, the mortality of the insects does not increase in a regular proportion to the length of exposure.

In the case of chloropicrin an economy of 1 oz. to 1,000 cu. ft. was obtained by accelerated evaporation. This was effected by placing the fumigant in the deeply concave lid of a tank of boiling water, the heat causing it to evaporate in 10–15 minutes as compared with 9 hours when it was kept cold. The cost of fumigating with carbon bisulphide and chloropicrin is compared in a table. With an exposure of 8 hours and temperatures below 21° C. [69·8° F.], chloropicrin is considerably cheaper ; at higher temperatures there is a marked decrease in the amount of carbon bisulphide required and the cost of the two substances becomes almost equal. Accelerated evaporation decreases the dosage, and consequently the cost, of both fumigants.

Observations on the absorption of the fumigants by the grain indicated that in full granaries the dosages of carbon bisulphide should be

increased by 15–25 per cent. in order to attain complete control in 8 hours at 25–27° C. [77–81·6° F.], whereas that of chloropicrin should be increased by 280 per cent. As the grain continues to give off the absorbed gas for some time, repeated ventilation of the granary is required, especially in view of the lachrymatory properties of chloropicrin.

In experiments on the effect of different atmospheric pressures on the insects during fumigation, it was found that a low pressure was more satisfactory, a rise from 1½ atmospheres to 3 decreasing the mortality of *C. granaria* by 24 per cent. and of *T. confusum* by 56 per cent.

The rapidity of the penetration of the fumigants is discussed as well as its dependence on temperature, dosage, atmospheric pressure, mode of evaporation and kind of product fumigated. The author concludes that the toxicity of chloropicrin averages only 8–12 times higher than that of carbon bisulphide, and that it is more expensive for use in full granaries.

[Romanova (V. P.).] **Романова (В. П.). Ueber die Schädlinge der Tabak.** [On Pests of Tobacco. (*In Russian.*)]—*Bull. N. Caucas. Pl. Prot. Sta.*, v, pp. 45–48, 2 figs. Rostov-on-Don, 1930. (With a Summary in German.)

Notes are given on the seasonal occurrence and local distribution of a number of tobacco pests observed in the northern Caucasus in the years 1925–29, the percentage and the character of the damage caused being indicated in some cases. The most important are *Thrips tabaci*, Lind., which severely infests all plantations in August ; *Dolycoris baccarum*, L., which is especially injurious in June, most of the eggs found in July being parasitised by *Telenomus sokolowi*, Mayr ; and *Euxoa segetum*, Schiff., especially the larvae of the spring generation, though in some localities the larvae are heavily parasitised by *Ichneumon sarcitorius*, L., and *Amblyteles equitatorius*, Panz. The larvae of *Heliothis* (*Chloridea*) *obsoleta*, F., were very abundant in August 1929, the damage caused reaching 90–100 per cent. in September ; parasites reared from them were *Anilastus notatus*, Grav., *A. ruficinctus*, Grav., and *Barylypa pallida*, Grav. (*insidiator*, Först.).

[Mushinskiĭ (A. I.).] **Мушинский (А. И.). Materialien zum Studium der schädlichen Heupferden im Nord-Kaukasus.** [The injurious long-horned Grasshoppers in the northern Caucasus. (*In Russian.*)]—*Bull. N. Caucas. Pl. Prot. Sta.*, v, pp. 65–74, 1 map, 1 ref. Rostov-on-Don, 1930. (With a Summary in German.)

The long-horned grasshoppers that have been recorded as pests in the northern Caucasus are *Decticus verrucivorus*, L., *Tettigonia caudata*, Charp., *T. viridissima*, L., *Pholidoptera noxia*, Ramme (*indistincta*, Bol.) and *Poecilimon heroicus*, Stshelk., which damage grain crops, melons and cucumbers in the eastern and central districts ; and *Pholidoptera pontica*, Ret., *Isophya* sp. and *Poecilimon* sp., which attack various field and garden crops, as well as forest trees, in the western areas.

Brief biological and ecological notes on these Tettigoniids are given. Uncultivated areas, such as mountain slopes and ravines with scrub vegetation, afford favourable breeding-places. Sprays of sodium arsenite or Paris green and poisoned baits are recommended for control.

[DOBROVOL'SKIĬ (B. V.).] **Добровольский (Б. В.). Bockkäfer** (*Agapanthia*) **als Schädlinge der Sonnenblume im Nord-Kaukasischen Gebiet.** [Longicorn Beetles (*Agapanthia*), injurious to Sunflower in the North-Caucasian Region. (*In Russian.*)]—*Bull. N. Caucas. Pl. Prot. Sta.*, v, pp. 75–96, 14 figs., 1 fldg. table, 2 refs. Rostov-on-Don, 1930. (With a Summary in German.)

This is an account of observations carried out in the northern Caucasus in the years 1925–29 on the Lamiids, *Agapanthia dahli*, Richt., and *A. cynarae*, Germ., attacking sunflowers, which are extensively cultivated. The characters distinguishing the two species are indicated. *A. dahli* is found in all the districts where sunflowers are grown, whereas *A. cynarae* occurs in the south and south-west only. In 1928, the percentage of infested plants varied in different localities from 34·3 to 80·6.

The emergence of the adults, which live about 2 months, covers a period of about six weeks and begins in the first half of May in the south or somewhat later in the north. They feed on the epidermis of the stems and oviposit when the plants are flowering, the eggs being deposited usually singly in pits that the female makes with its ovipositor in the stem after first gnawing an opening in it. Infested stems can easily be distinguished by the brown spots where the eggs have been laid. Infestation chiefly occurs on the borders of the fields, to which the young beetles usually migrate from the stubble of adjacent ones of the preceding year. *A. cynarae* was also found ovipositing and feeding on hemp, and both species on elder (*Sambucus*) and various weeds growing near the sunflower fields. The egg stage averages 10 days, and the first larvae appear while the sunflowers are still in bloom. The larvae probably destroy each other, as although two or three of different instars were often found in the same stem in the summer, only one occurred in the autumn, when their galleries converged to form a common tunnel. In September most of the mature larvae are to be found in the upper part of the root, below the root-collar, where they hibernate. The larval stage lasts 10–11 months, and the pupal 6–17 days, the pupae occurring from the end of April till about mid-June.

If the plants are attacked at an early stage of growth, as is usually the case in the northern districts, they are often broken by the wind or wither; towards the south, where the plants are more mature at the time of oviposition, the damage done is negligible, no loss in the yield of seeds or their oil content being caused. Some varieties are more resistant than others, and late sowings are markedly more susceptible to injury. All stubble should be dug out and burnt before May and weeds round the plantations destroyed.

[ZAKHAROV (L. Z.).] **Захаров (Л. З.). Die Meliorieren der " Plavni " und die Bekämpfung der Heuschrecken in Kreis Kuban.** [The Reclamation of the Reed Swamps and the Locust Problem in the Kuban. (*In Russian.*)]—*Bull. N. Caucas. Pl. Prot. Sta.*, v, pp. 97–104, 8 refs. Rostov-on-Don, 1930. (With a Summary in German.)

The history of the reclamation of the reed swamps in the Azov region demonstrates that instead of exterminating *Locusta migratoria*, L., the gradual drying up of the swamp creates conditions that, for a time, are very favourable for its breeding on a large scale. The gradual change of vegetation and of soil conditions accompanying the conversion of swamp

into steppe is discussed, with special reference to changes in the Orthopterous fauna. During the first stages of the process, the partly dried swamps form suitable breeding grounds for *L. migratoria*, and by the time the steppe conditions are reached, the area becomes populated by numerous Acridids, including *Dociostaurus maroccanus*, Thnbg., and *Calliptamus italicus*, L., which feed readily on various crops and are the most dangerous.

[SVIRIDENKO (P. A.).] **Свириденко (П. А.). Pflanzenschutz in der Tuerkei.** [The Protection of Plants in Turkey. (*In Russian.*)] —*Bull. N. Caucas. Pl. Prot. Sta.*, v, pp. 173–184, 3 figs., 1 map, 2 refs. Rostov-on-Don, 1930. (With a Summary in German.)

The present organisation for the control of pests in Turkey is described. The main problem is that of locust control, which is efficiently met, the principal method being the use of zinc barriers, which are applied on a very large scale and with good results. Special motor-car units are employed for the prompt transport of the barriers.

In 1928, three species of locusts occurred in Turkey. *Dociostaurus maroccanus*, Thnbg., was present in northern Mesopotamia, southern Kurdistan and the vilayets of Aleppo and Diarbekir, as well as in some other localities. *Calliptamus italicus*, L., appeared in some places, but did no appreciable damage. *Schistocerca gregaria*, Forsk., invaded Turkey from the south and oviposited in April in the Aleppo and Diarbekir vilayets. The swarms of the next generation, together with new swarms from the south, invaded the country up to Bitlis, Ersindzham and Van, but later returned southwards.

[SUKHORUKOV (N. N.).] **Сухоруков (Н. Н.). Versuche einer Anwendung mechanischer Methoden zur Bekämpfung des Rübenzünslers** (*Loxostege sticticalis* **L.**). [An Attempt to apply mechanical Methods in the Control of *Loxostege sticticalis*. (*In Russian.*)]—*Bull. N. Caucas. Pl. Prot. Sta.*, v, pp. 185–186. Rostov-on-Don, 1930. (With a Summary in German.)

A severe outbreak of *Loxostege sticticalis*, L., occurred in the northern Caucasus in 1929, but fields were completely protected from invasion by the migrating larvae by shallow trenches lined with sunflower leaves, on which crude oil residue was poured. This material killed the larvae that came in contact with it, the leaves being used to prevent it from being absorbed by the soil.

[ZAKHAROV (L. Z.).] **Захаров (Л. З.). Das abendliche Emporkletten der Wanderheuschrecke an den Pflanzen.** [The Climbing of the migratory Locust on Plants in the Evening. (*In Russian.*)]—*Bull. N. Caucas. Pl. Prot. Sta.*, v, pp. 187–189. Rostov-on-Don, 1930. (With a Summary in German.)

The climbing of plants in late afternoon by hoppers of *Locusta migratoria*, L., is not due to their positive thermotropism, since the actual temperature on the plants is at that time often lower than on the ground, but is probably due to heliotropism.

[KOZHANCHIKOV (I. V.).] **Кожанчиков (И. В.). Data for the Study of Pests and Diseases of the Vine. (Results of a Survey of the Plantations of European Vine in Uzbekistan in 1929.)** [*In Russian.*]—[*Pub.*] *Uzbekist. opuitn. Sta. Zashch. Rast.*, no. 17, 80 pp., 6 figs., 1 graph, 6 refs. Tashkent, April 1930. Price 80 *kop.*

Part of this report (pp. 33–63) deals with the insect pests of vines in Uzbekistan, some of which were not actually observed during the survey. In some cases notes are given on their bionomics and control. *Polychrosis botrana*, Schiff., and *Clysia ambiguella*, Hb., were the most important, causing in some localities a loss of half the crop. *P. botrana*, which is discussed in some detail [*cf. R.A.E.*, A, xvii, 590], has four generations a year, the larvae of the first occurring in May, and those of the fourth being abundant in the first half of September. *C. ambiguella*, which had not previously been recorded in Uzbekistan, infested one variety almost exclusively and only attacked grapes that rested on the ground ; it is suggested that the vines should be trained on espaliers in order to expose the bunches to the sun and air.

The roots of the vines were attacked by *Rhizoglyphus* sp. and the larvae of *Polyphylla adspersa*, Motsch., *Melolontha afflicta*, Ball., *Amphimallus* (*Rhizotrogus*) *solstitialis*, L., and *Cicadatra querula*, Pall. ; the young shoots by *Oecanthus pellucens turanicus*, Uvar. ; and the leaves by *Tetranychus* sp., *Eriophyes vitis*, Land., *Antispila rivillei*, Stt., *Deilephila lineata* var. *livornica*, Esp., *Empoasca* (*Chlorita*) *flavescens*, F., and adults of *Labidostomis centrisculpta*, Pic. *Pergesa* (*Chaerocampa*) *elpenor*, L., and *Theretra* (*C.*) *alecto*, L., damaged both leaves and shoots ; there were two generations a year, and hibernation took place in the soil in the pupal stage. The larvae of the former occurred from the beginning of June till mid-July, and those of the latter from mid-August till late in the autumn. *Hysteropterum asiaticum*, Leth., infested the tendrils and the peduncles of the leaves, and *Lecanium corni*, Bch., the primary food-plant of which in Uzbekistan is *Robinia pseudacacia*, occurred on all parts of the plants.

No instance of infestation by *Phylloxera* was found, but investigations indicated that the type and temperature of the soil offer very favourable conditions for it.

[SEREBRENNIKOV (M. K.).] **Серебренников (М. К.). The pink Starling** (*Pastor roseus* **L.**)**, its Life Habits and economic Importance in Uzbekistan.** [*In Russian.*]—[*Pub.*] *Uzbekist. opuitn. Sta. Zashch. Rast.*, no. 18, 53 pp., 14 pls. Tashkent, May 1930. Price 1 *rbl.* 20 *kop.*

Pastor roseus is one of the principal enemies of locusts (*Dociostaurus maroccanus*, Thnbg., and *Calliptamus italicus*, L.) in Central Asia. Numerous nesting colonies were found in the rocky valleys of the low mountain ridges about 60 miles from Tashkent. Here the birds nest every year, for the surrounding steppe supports a regular population of locusts, but they only breed in Turkmenistan during the periodical locust outbreaks.

Observations show that as many as 200 second or 120 fourth stage hoppers can be devoured by a starling in a day. The appetite of the birds is increased if they have water to drink ; but contrary to the common belief, they do not kill more locusts than they can eat. During

the nesting period both sexes feed the young, the food consisting exclusively of Acridids. When the young birds are fully fledged, the starlings migrate to oases, where they cause a great deal of damage to grapes, but analyses of their stomach contents showed that Acridids predominate over other kinds of food. The nesting colonies should therefore be protected ; a survey of them is being undertaken for this purpose.

[PLOTNIKOV (V. I.).] **Плотников (В. И.). Prospects of controlling Pests of Plants.** [*In Russian.*]—*Za Rekonstr. sel'sk. Khoz.* [*For the Reconstr. Agric.*], ii, no. 2–3, pp. 161–169. Samarkand, 1930.

In view of the proposed cultivation of vast areas of land in Uzbekistan and the organisation of collective farming, the author discusses pests that are likely to attack cotton, cereals, vegetable crops, fruit trees, vines and stored products, and possible measures of controlling them.

[PUDOVKIN.] **Пудовкин (—). The forthcoming Campaign against** *Schistocerca gregaria*, **Forsk. in Uzb. S.S.R.** [*In Russian.*]—*Za Rekonstr. sel'sk. Khoz.* [*For the Reconstr. Agric.*] ii, no. 2–3, pp. 170–176. Samarkand, 1930.

In 1929, *Schistocerca gregaria*, Forsk., was exterminated in Uzbekistan over about 320 acres. Poison baits were used on about 52 acres, and the remainder of the area was dealt with by means of the usual mechanical methods. In the latter case the cost of labour was about 2*s*. per acre more than that of labour and material for the baits. The almost exclusive use of these and the concentration of energies on the extermination of the hoppers were therefore recommended for the invasion that was expected to take place in May 1930.

BISHARA (I.). **Ratoon Cotton in Relation to Insect Pests.**—*Bull. Minist. Agric. Egypt*, no. 96, 68 pp., 29 figs., 30 refs. Cairo, 1930.

In an introduction brief notes are given on the more important pests attacking cotton in Egypt. As only late cotton crops are badly damaged by bollworms, various methods have been studied for maturing the crop before they have multiplied to any serious extent ; these include early sowing, reduced watering, the planting of early varieties, autumn planting and ratooning. Although the present bulletin deals mainly with the question of ratooning, a few notes are given on the other methods. In 1912, ratooning was prohibited by legislation in order to render the close season against *Earias insulana*, Boisd. (Egyptian bollworm), etc., more effective, but with the advent of the pink bollworm, *Platyedra* (*Gelechia*) *gossypiella*, Saund., which became the worst cotton pest of Egypt after 1913, the situation changed, and other methods besides the prohibition of ratooning had to be adopted. The author discusses experiments on ratoon cotton in various parts of Egypt during 1925 and 1926, and describes in particular a large-scale experiment to

determine the extra damage from bollworms on annual cotton owing to the presence of ratoon, the results being shown in diagrams and charts.

Ratoon cotton begins to flower about three weeks earlier than annual cotton, and most of the flowers open within a very short time, so that the first crop is taken about 4 to 6 weeks earlier. The emergence of *P. gossypiella* from the resting stage varies considerably with the locality, date of picking, state of bolls (whether green, open or dead) and situation and conditions of temperature and moisture under which the bolls are developing. The chief sources of infestation in the new crop are bolls scattered in the field or buried in the soil and seeds that have not been properly treated used for planting (from which emergence occurs in April and May under moist conditions), and bolls on cotton sticks on roofs of houses and seed-cotton in villages and ginneries where ginning is delayed (from which the maximum emergence is in July under dry conditions). The proportion of moths in each category is difficult to determine. Those appearing in April and May probably die in large numbers without ovipositing, finding no cotton suitable, but if flowering ratoon cotton is present, oviposition is encouraged and breeding continues until the annual cotton is ready, this receiving, in addition to the normal infestation, many of the moths that have been breeding on the ratoon. Ratoon cotton at the final picking is less severely damaged than annual cotton ; this is because comparatively few moths are present to start the early attack, and the reduced flowering period of the ratoon crop gives a shorter time for multiplication. The chief objection to ratooning is its adverse effect on annual cotton in the vicinity. Detailed investigations showed that very heavy bollworm infestation occurred on annual cotton nearest to ratoon, with a gradual reduction as the distance increased. The indications are that the effect would not be negligible within a distance of about two-thirds of a mile.

Earias insulana is even more encouraged by ratoon cotton than *P. gossypiella*, as it has no resting stage; in one locality the proportion of *Earias* was more than four times the normal when ratooning was allowed. All the larvae of *P. gossypiella* occurring in summer in Egypt are short-cycle larvae ; in late August the resting stage becomes apparent, and by October about 90 per cent. of the larvae are long-cycle ones. This indicates that warm summer weather induces pupation and that the coolness of autumn encourages resting. Apparently dryness of food also induces resting. High temperature combined with moisture causes the larvae to forsake their resting cocoons for pupation, the response being immediate ; high temperature combined with dryness or low temperature with moisture cause the same change, but the response is slow and interrupted. Under continued cool and dry conditions, the larvae very rarely, if ever, pupate. In countries with a warm, humid climate the resting stage does not occur. The examination of many bolls and seeds from various sources has shown that the early crop of ratoon is accompanied by early assumption of the resting state, though the total number of resting larvae in ratoon is much lower than in annual cotton. This point would have been in favour of ratoon if it were possible in a certain zone to grow annual cotton in one year and only ratoon in the following year, and so on consecutively ; it is very difficult, however, to apply such regulations under ordinary conditions. *Aphis gossypii*, Glov., and *Prodenia litura*, F., attack ratoon only lightly, but these are minor pests, and in view of the grave danger from *P. gossypiella* and *E. insulana*, it is considered quite justifiable to condemn the practice of ratooning.

FRANZ (E.). **Ein neuer indischer *Chelonus* (Ins. Hym.).** [A new Indian *Chelonus*.]—*Soc. ent.*, xlv, no. 11, p. 47. Stuttgart, 1st November 1930.

The Braconid, *Chelonus cycloporus*, sp. n., is described from the Central Provinces as a parasite of the larva of the Tineid, *Holcocera pulverea*, Meyr., which is predacious on lac insects.

FULLAWAY (D. T.). **Report of the Entomologist covering the Period from January 1, 1929, to December 31, 1929.**—*Hawaii. For. Agric.*, xxvii, no. 1, pp. 45–50. Honolulu, 1930.

A list is given of the pests intercepted in Hawaii in 1929, some of which have already been noticed [*R.A.E.*, A, xvii, 708 ; xviii, 468].

A survey during the spring showed that rice was free from infestation by the rice borer [*Chilo simplex*, Butl.] in localities on the leeward side of Oahu, where large numbers of its parasites had been liberated in 1928. As many as 45–50 bags of rice to the acre were obtained, as compared with only 15 when infestation of the rice borer was at its worst. Conditions were not so satisfactory in localities where only a small number of parasites had been distributed.

At the close of the previous season, of a number of imported parasites, only *Trichogramma japonicum*, Ashm., was known to have become established. During the year under review, of the parasites imported in 1928 [*cf.* xvii, 194], *Amyosoma chilonis*, Vier., and *Angitia* (*Dioctes*) *chilonis*, Cushm., were found established in the field. The records at the insectary show that in 1929 the numbers of parasites reared and distributed on the islands of Oahu and Kauai were : *Trichogramma japonicum*, 52,000 ; *Phanurus beneficiens*, Zehnt., 21,800 ; *T. australicum*, Gir., 5,800 ; *Amyosoma chilonis*, 5,575 ; and *Amyosoma* sp., 750. The Ichneumonid, *Nesopimpla narangae*, Ashm., which was previously known to occur in the islands, although probably of Oriental origin, was abundant in the early summer in rice-fields in one locality in Oahu.

Various insectivorous birds have been introduced, most of which were liberated on Oahu.

CELINO (M. S.). **A fungous Disease of the Coconut Leaf Miner (*Promecotheca cumingii* Baly).**—*Philipp. Agric.*, xix, no. 4, p. 253. Laguna, P.I., September 1930.

A fungus obtained in the Philippines in January 1930 from a dead individual of *Promecotheca cumingi*, Baly (coconut leaf-miner) was isolated in pure culture. In experiments in which the insects were sprayed with the spores suspended in water, an average mortality of 58 per cent. occurred in 6 days.

PIERCE (W. D.). **The Sugar Cane Insect Problem in Negros.**—*Proc. Ent. Soc. Wash.*, xxxii, no. 6, pp. 99–104. Washington, D.C., June 1930.

A list of the principal insects attacking sugar-cane in Negros, Philippine Islands, is given. Owing to the equable climate, sugar-cane is cultivated throughout the year. From data collected monthly on the injury caused to the crop by various insect pests and on the percentage of parasitism occurring in the field, it was estimated that the crops in

April 1928 and October 1929 would have been practically destroyed by borers that cause dead heart, particularly *Eucosma* (*Olethreutes*) *schistaceana*, Sn., if no egg parasitism had taken place. The control measures recommended were a system of clean culture and the redistribution of the egg parasites from areas where the percentage of parasitism is high to those where it is low.

Rendell (E. J. P.). **Depredations to Lead-covered aerial Cables by Beetles in Brazil.**—*Proc. Ent. Soc. Wash.*, xxxii, no. 6, pp. 104–113, 1 pl., 1 fig., 1 ref. Washington, D.C., June 1930.

The Cerambycid, *Megaderus stigma*, L., has been causing considerable damage to aerial telephone cables in Brazil. The eggs are laid on the lead cable sheath, into which the larvae bore, as many as 80 holes being found in a length of 130 ft. The holes appear in a 45° sector on either side of the centre in the upper half of the sheath, and low insulation is caused by moisture passing through them. In one area infestation is said to have been prevented by wrapping the lead sheath with white cotton tape, the tape being painted afterwards with a red oxide paint. A covering of tarred jute would probably protect the lead sheath from the larvae and make it distasteful to the female beetle.

A consignment of 10 male and female beetles was sent to R. C. Shannon, whose observations showed the egg stage to last from 4 to over 9 days. The larvae do not ingest the lead as they bore through it, and those in lead cable doubtless die through lack of food and water. The probable life-history of *M. stigma* in wood is indicated. In a footnote T. E. Snyder refers to *Xylopertha* (*Scobicia*) *declivis*, L. [*R.A.E.*, A, xi, 181], which attacks lead-sheathed aerial cables in the adult stage, and states that damage to metal by insects is apparently accidental.

Moreira (C.). **Insectos que corroem o chumbo.** [Insects that attack Lead.]—*Bol. Inst. biol. Defesa agric.* [*Brazil*], no. 8, 8 pp., 4 pls. Rio de Janeiro, 1930.

An account is given of recent observations on damage to the lead covering of electric cables at Recife and other towns by larvae of *Megaderus stigma*, L. [see preceding paper]. The adults are attracted by light, and if an egg is laid on an electric cable, the larva eats through the egg-shell at the side adhering to the support and bores into the lead cover. The cables can be protected by a coating of grease, which usually prevents the beetles from settling. Even if they do oviposit, the eggs do not adhere firmly, and the larvae cannot penetrate the lead because they lack a support to work from.

Bondar (G.). **Duas brocas das leguminosas.** [Two Borers of Leguminosae.]—*Correio agric.*, vii, no. 4, pp. 97–99, 2 figs. Bahia, April 1929. [Recd. 1930.]

The larva of *Metoposoma canavaliae*, Mshl., bores in stalks of various climbing Leguminosae, such as *Canavalia* and *Dolichos lablab*, in Bahia, being usually found in the woody parts. In view of the small amount of plant-tissue consumed, it probably feeds largely on the sap. The presence of the weevil is revealed by sap and débris at the entrance-hole where the egg was laid. Pupation occurs in the mine. The adult

weevils are active at night, hiding by day beneath the bark, in cracks, etc. A translation is given of the original description [*R.A.E.*, A, xvii, 349]. *M. porosum*, Mshl., which develops in the heartwood of *Lonchocarpus neuroscarpha* in Bahia and S. Paulo, has a similar life-history.

Bondar (G.). **Uma nova praga da Pinha,** *Conotrachelus bondari*, **Marshall.** [*C. bondari*, a new Pest of the Custard Apple.]—*Correio agric.*, vii, no. 5, pp. 121–125, 3 figs. Bahia, May 1929. [Recd. 1930.]

Conotrachelus bondari, Mshl. [*R.A.E.*, A, xvii, 349] attacks custard apple (*Anona squamosa*), ovipositing in the bark of the trunk and branches, and in the shoots and fruits, in which the larvae develop. Branches and young stems are often ringed and killed by the larva mining under the bark. Pupation takes place in the soil. The measures advised are painting the trunk with milk of lime, turning up the soil at the foot of the tree and mixing in ashes or quicklime, and keeping fowls in the orchard. A more toxic insecticide than milk of lime might be used for painting the trunk and for spraying to protect the shoots and fruits.

Bondar (G.). **Biologia do genero** *Rhyssomatus*. *Rhyssomatus psidii*, **Marshall, praga das goiabeiras.** [Biology of the genus *Rhyssomatus*. *R. psidii*, a Pest of Guava.]—*Correio agric.*, vii, no. 6, pp. 148–150, 2 figs. Bahia, June 1929. [Recd. 1930.]

Rhyssomatus psidii, Mshl. [*R.A.E.*, A, xvii, 349] develops in the shoots of guava and in the fruits of various Myrtaceae in Bahia. The adult weevils attack the leaf-buds of guava, making holes in the bases of the petioles that cause the leaves to rot. The eggs are laid in new shoots and the larvae mine downwards. *R. sculpturatus*, Chev., was observed in Bahia in the fruits of *Ipomoea* spp., such as *I. fistulosa* and probably sweet potato. The female oviposits in the newly formed fruit capsule, and the larva feeds on the seeds, maturing in 12–15 days. Both these species pupate in the soil, the pupal stage lasting about a month.

Bondar (G.). **A Lagarta verde das vagens dos feijões.** *Fundella pellucens* **Zeller fam. dos Pyralideos.** [The green Caterpillar of Bean Pods, *F. pellucens*.]—*Correio agric.*, vii, no. 6, pp. 162–163. Bahia, June 1929. [Recd. 1930.]

The Pyralid, *Fundella pellucens*, Zell., causes losses of from 5 to 50 per cent. in cultivated beans and *Vigna catjang* in Bahia by infesting the pods and destroying the seeds. The adult oviposits externally, and the larva leaves the pod to pupate on dry parts of the plant. The pupal stage lasts about 12 days, and the total life-cycle 45–50. Wild leguminous plants are also attacked.

Bondar (G.). **A broca das pontas do Cajueiro.** [The Borer of the Branch Tips of the Cashew-tree.]—*Correio agric.*, vii, no. 11, pp. 297–298, 1 fig. Bahia, November 1929. [Recd. 1930.]

The Tineid, *Anthistarcha binocularis*, Meyr., is a serious pest of cashew (*Anacardium occidentale*) in Bahia. The eggs are laid on the tips of the twigs, and the larvae, which occur from July to September, mine in the new shoots and the peduncles of the inflorescences. They mature in

about a fortnight and pupate in their mines, the pupal stage lasting a week. Sprays of Paris green may be used to kill the larvae as they begin to bore into the plants.

Bondar (G.). **Microlepidoptero** *Aegerina vignae* **Busck, sp. nov.—Praga das leguminosas cultivadas.** [*A. vignae*, Busck, a Pest of cultivated Leguminosae.]—*Correio agric.*, vii, no. 12, pp. 330–332, 3 figs. Bahia, December 1929. [Recd. 1930.]

Aegerina vignae, Busck [*R.A.E.*, A, xviii, 162] infests the stems of *Vigna catjang* in Bahia, causing swellings in which about ten larvae may be found together. Pupation occurs in the mines or sometimes elsewhere on the plant. Other food-plants include *Dolichos lablab*, *Canavalia ensiformis*, and Lima bean (*Phaseolus lunatus*). Infested plants do not bear pods.

Bondar (G.). **Uma nova praga do cacaoeiro—o Podador.** [A new Cacao Pest, the Pruner.]—*Correio agric.*, viii, no. 5, pp. 124–127, 2 figs. Bahia, May 1930.

The weevil, *Chalcodermus marshalli*, sp. n., is described from cacao in Bahia. The female bores into the twigs to oviposit, causing the tips to bend over or break off, as is the case with cotton similarly infested by *C. bondari*, Mshl. [*R.A.E.*, A, xv, 610]. The larva hatches in a few days and mines in the shoot, causing it to wither and die. After about ten days, it leaves the shoot and pupates in the soil. Though the adults are seen on the tips by day, they probably attack the twigs at night. They may be captured by jarring the trees, and the eggs and larvae may be destroyed by collecting the infested tips.

Bondar (G.). **Insectos damninhos e molestias da batata doce no Brasil. Primeira contribuição.** [Insect Pests and Diseases of the Sweet Potato in Brazil. First Contribution.]—*O Campo*, i, no. 9, pp. 17–20, 3 figs. Rio de Janeiro, 1930.

The Aphid, *Geoica floccosa*, Moreira, is very injurious to sweet potato (*Ipomoea batatas*) in Bahia. Coccid pests include *Orthezia insignis*, Dougl., *Pseudococcus citri*, Risso, *Aspidiotus cyanophylli*, Sign., and *Saissetia oleae*, Bern. Three Thysanoptera also occur on the plants, *viz.*, *Dinurothrips hookeri*, Hood, *Heliothrips ipomoeae*, sp. n., and *Scirtothrips batatae*, sp. n.

Blanchard (E. E.). **Principales insectos y enfermedades que perjudican los cultivos citricos en la República Argentina.** [The principal Insects and Diseases injurious to Citrus Cultivation in the Argentine Republic.]—[*Circ.*] *Minist. Agric. Argentina*, no. 815, 114 pp., 43 figs., 8 pls. Buenos Aires, August 1930.

Over 50 pages of this work are devoted to insect pests of *Citrus* in Argentina, brief notes being given on the bionomics and control of each. A separate chapter deals with remedial measures in greater detail. Notes on beneficial insects and a key to the Coccids occurring on *Citrus* are included.

BATES (M.). **La nueva plaga del café en Guatemala.**—*Bol. Agric. Guatemala*, ix, no. 6, pp. 310–314. Guatemala, June 1930.

A Homopterous insect observed at Antigua (Guatemala) injures coffee in the process of oviposition, the eggs being found beneath the bark of the stem and in the pith of green branches.

MEYRICK (E.). **Exotic Microlepidoptera, iv, pt. 1.**—pp. 1–32. Marlborough, Wilts, the author, December 1930. Price 3*s*. per part.

Among the species recorded are the Tineids, *Hoplophractis heptachalca*, Meyr., bred from larvae feeding externally on seeds of *Clidemia hirta* in Trinidad, and *Paralecta antistola*, sp. n., from larvae boring stems of cloves (*Eugenia caryophyllata*) in Malaya.

HERMAN (F. A.). **Some chemical Problems involved in the Study of Insecticides and Fungicides.**—*21st Ann. Rep. Quebec Soc. Prot. Plants 1928–29*, pp. 10–16. Quebec, 1929. [Recd. 1930.]

The subjects discussed in this paper include methods of analysis of arsenicals for water-soluble arsenic, etc., the results of analysing samples of Paris green and calcium arsenate by different methods being shown in tables ; the examination of poisonous dusts and foliage for electrical charges ; methods of removing spray residue from fruit ; and the examination of petroleum oils for spray purposes.

BRITTAIN (W. H.). **Some Advantages of Nicotine Dusting.**—*21st Ann. Rep. Quebec Soc. Prot. Plants 1928–29*, pp. 33–36, 5 refs. Quebec, 1929. [Recd. 1930.]

Several years' experience in controlling such insects as *Lygus communis*, Knight, on apples with nicotine sulphate have led the author to the conclusion that sprays do not give such good results as 5 per cent. dusts (2 per cent. actual nicotine) under Nova Scotia conditions, in view of the drenching spray required and the need for very rapid application. The potato aphis, *Macrosiphum gei*, Koch (*Illinoia solanifolii*, Ashm.), which is very resistant to sprays, as well as other sucking insects on low-growing crops, can be completely controlled by means of a dust of 4 per cent. nicotine sulphate used in conjunction with a canvas trailer.

HAMMOND (G. H.). **Sulphur as a Deterrent to June Beetle (*Phyllophaga anxia* Lec.) Oviposition in Timothy Sod.**—*21st Ann. Rep. Quebec Soc. Prot. Plants 1928–29*, pp. 37–38. Quebec, 1929. [Recd. 1930.]

Losses in certain districts of Quebec from infestation by larvae of *Lachnosterna* (*Phyllophaga*) *anxia*, Lec., are very heavy. Fields that are under grass when a major flight of the beetles occurs may contain enough larvae to injure susceptible crops in the following year. Experiments, the results of which are given in a table, showed that sulphur promises to be of value in deterring the beetles from ovipositing in grass areas that cannot be ploughed before the flight period. At least 80 per cent. protection was obtained when 567 lb. of sulphur dust was used to the acre, and nearly 100 per cent. when the amount was increased to about 1,500 lb.

FELT (E. P.). **Protection of Trees from Insects.**—*21st Ann. Rep. Quebec Soc. Prot. Plants 1928–29*, pp. 43–52, 12 figs. Quebec, 1929. [Recd. 1930.]

Brief notes are given on many of the commoner pests of shade trees occurring in the United States.

DUSTAN (A. G.). **Notes on the Distribution of the Cyclamen Mite,** *Tarsonemus pallidus*, **Banks.**—*21st Ann. Rep. Quebec Soc. Prot. Plants 1928–29*, pp. 48, 53. Quebec, 1929. [Recd. 1930.]

Tarsonemus pallidus, Banks (cyclamen mite) has been found widely distributed on strawberry in Canada, causing the plants to appear stunted and unhealthy, with the leaves curled and distorted. Localities in British Columbia, New Brunswick, the Niagara Peninsula and widely separated districts within 100 miles of Ottawa have all been affected in this manner, and the mite seems likely to become a serious pest of strawberries.

PAINTER (R. H.). **A Brief Note on the Occurrence of a Mermithid Parasite, Genus** *Hexamermis*, **in the Tarnished Plant Bug,** *Lygus pratensis*, **L.**—*21st Ann. Rep. Quebec Soc. Prot. Plants 1928–29*, pp. 53–55, 1 fig. Quebec, 1929. [Recd. 1930.]

In 19 of 30 adults of *Lygus pratensis*, L. (tarnished plant bug) dissected in May and June 1928 near Ottawa, a Nematode, *Hexamermis* sp., was found coiled about the intestinal tract and in a few cases extending into the thorax, the result of this parasitism being sterilisation of the host. All the parasitised individuals were found on or near an area of swampy waste land covered largely with goldenrod, none being found elsewhere in the vicinity. The indications are that the parasite occurs only in low-lying land that is more or less wet.

GROSSMAN (E. F.). **Biology of the Mexican Cotton Boll Weevil. V. Diurnal Observations of the Emergence of Boll Weevils from their Hibernation Quarters.**—*Florida Ent.*, xiv, no. 3, pp. 45–52, 1 graph. Gainesville, Fla., September 1930.

Experiments in Florida showed that *Anthonomus grandis*, Boh. (cotton boll weevil) usually leaves its hibernating quarters during the day-time, though emergence at night was also observed. Owing to the fact that in every year individuals emerge daily from 1st March to mid-July, regardless of climatic conditions, it appears that the weevils appear when they are physiologically ready to do so, and that daylight, rainfall and rises of temperature have little effect in accelerating the process.

LANGFORD (G. S.). **Some Factors relating to the Feeding Habits of Grasshoppers with special Reference to** *Melanoplus bivittatus*.—*Bull. Colorado Agric. Expt. Sta.*, no. 354, 53 pp., 6 figs., 84 refs. Fort Collins, Colo., January 1930.

Laboratory experiments were made in Colorado on the feeding habits of *Melanoplus bivittatus*, Say. The temperature range of normal activities is from 68 to 100° F., with the optimum from 98 to 100° ; no

eggs are laid when the air temperature is below 69°, or that of soil below 65°. At favourable temperatures feeding normally occurs throughout the day ; during the hottest period the grasshoppers select cooler places but still continue to feed. The amount of food consumed by an individual in 24 hours may vary from nothing at 55° F. to 11·3 sq. ins. of lettuce leaf at 95°. Individuals of the same brood vary in the amount of food consumed daily, and the same individual varies in this respect from day to day. The amount of food consumed depends on its kind; thus, three to four times as much lettuce is eaten as lucerne.

Since adults consume almost 100 times as much in a day as first instar hoppers, poison baits should be applied against the early stages. In order to be efficient, the baits should be scattered in the morning, when the ground temperature reaches 68° F., for when it is above 100°, the grasshoppers climb on the plants, and the baits become useless. Moulting may be responsible for the ineffectiveness of baits, since the insects do not feed for 1–2 days during the moults.

M. differentialis, Thomas, consumes about half as much food in a day as *M. bivittatus* or *M. femur-rubrum*, DeG.

Craighead (F. C.) & St. George (R. A.). **A new Technique in Tree Medication for the Control of Bark Beetles.**—*Science*, lxxii, no. 1869, pp. 433–435, 4 refs. New York, N.Y., 24th October 1930.

During 1926–28 the authors carried out experiments with injections of chemicals into pine trees infested with *Dendroctonus frontalis*, Zimm. The results obtained were conflicting. A high percentage of brood mortality occurred in some trees and with some chemicals, but in general the insects were killed only in a narrow strip above the points of injection. More thorough lateral distribution of the chemical was evidently required, and in 1929, 200 trees were treated by a method that involved ringing the bark. The bark was smoothed completely round the tree near its base by a rasp or knife so as to permit a water-tight application. An incision $\frac{1}{8}$–$\frac{1}{4}$ in. wide was then made round the tree through the smoothed bark and two or more annual layers of wood. Into one side of the tree an auger hole, about $\frac{1}{2}$ in. in diameter and 1 in. deep, was bored, with the centre of the hole on the incision. For making a water-tight connection round the tree, a strip of rubber band about 2 ins. wide was stretched over the incision and placed preferably so as to overlap at the point where the auger hole was bored, or impervious plastic putty or waxlike material was applied. Grafting wax was the most practical material tried, and this method was most advantageous on trees of irregular circumference. At a convenient distance above the incision, a container for the liquid that was to be injected was hung, connected to the incision by rubber tubing ending in a piece of metal pipe about $\frac{1}{4}$ in. in diameter. This pipe was inserted into the auger hole. In this way as much liquid as was necessary was injected into the tree in a few hours. Two quarts were sufficient in most cases on the relatively small trees used. Complete brood mortality was obtained in practically all cases with some chemicals, if the application was made before the sapwood became blue-stained by associated fungi and the ascending sap stream disturbed. A table is given summarising the quantities and the results obtained with eleven of the materials used. In the case of conifers, which are more susceptible than other trees to girdling of the cambium, two or more breaks in the incision may be left on the circumference, which

will greatly accelerate subsequent healing, and the incisions connected with a drill, or a separate container or attachment used with each incision.

INGRAM (J. W.) & DOUGLAS (W. A.). **Damage by the Rice Water Weevil proved negligible.**—*Bull. Louisiana Agric. Expt. Sta.*, no. 214, 8 pp. Baton Rouge, La., August 1930.

Lissorhoptrus simplex, Say (rice water weevil) is present in most of the rice fields in the southern United States [*cf. R.A.E.*, A, xvi, 386]. Cage experiments and field observations, however, indicated that it has little, if any, effect on the yield of the grain or the straw, and that the symptoms supposed to result from infestation of the roots by the larvae are due to other causes.

KNOWLTON (G. F.). **Studies on the Beet Leafhopper.**—*Proc. Utah Acad. Sci.*, vii, pp. 57–58. Salt Lake City, Utah, July 1930.

Studies were carried out in 1928 and 1929 in northern Utah to determine the resistance of sugar-beets when inoculated with curly-top by means of *Eutettix tenella*, Baker. On examination of the parts above ground, 94 per cent. of the plants showed positive symptoms of curly-top and 84 per cent. were severely affected. In this region the leafhopper has both temporary and permanent breeding grounds; in the former it is only present during part of the season or in certain years, but in the latter, conditions are favourable for overwintering and there is a succession of favourable food-plants, a list of which is given.

SORENSON (C. J.). **The Alfalfa-seed Chalcis-fly in Utah 1926-29, inclusive.**—*Bull. Utah Agric. Expt. Sta.*, no. 218, 36 pp., 8 figs., 17 refs. Logan, Utah, 1930.

An account is given of investigations begun in 1926 on *Bruchophagus funebris*, How. [*R.A.E.*, A, vii, 327; viii, 361; xiv, 160, etc.], which is suspected of causing serious damage annually to the seed crop of lucerne in Utah. Seed samples from representative fields showed an average infestation of 9·13 per cent. in 1926, 9·75 in 1927, 11·51 in 1928, and 24·37 in 1929. This Eurytomid, all stages of which are described, appears in the fields early in May and disappears at the first autumn frost. Most of the eggs hatch in 4 days; the feeding period of the larvae averages 10·5 days, the pupal period of the summer broods 11·8 and of the overwintered larvae 16. Two generations and a partial third occur annually. The extent of the damage may be reduced by planting recleaned seed, and by destroying chaff stacks before 1st May. Self-sown lucerne should not be allowed to seed. The crops should be harvested before the seed begins to drop, and no waste seed should be left in the field to permit of the emergence of adults in the following spring. Control of the insects in fallen seed may be effected by burying it 2–2·5 ins. below the ground or by the use of a burning machine on the fields. If possible, seed should be obtained from the second crop, for by cutting the first growth no seed is available for the ovipositing females of the overwintered generation. In any case, all growers should co-operate in the choice of the crop for seed, so that migration from seed of the first growth to that of the second in adjacent fields does not occur.

BENNETT (C. W.). **Further Observations and Experiments on the Curl Disease of Raspberries.**—*Phytopathology*, xx, no. 10, pp. 787–802, 2 figs., 11 refs. Lancaster, Pa., October 1930.

The disease known as curl of raspberries has been found in Michigan to be due to two viruses to which varieties of raspberry differ in susceptibility. Transmission of them was obtained only by means of *Aphis rubicola*, Oestl. (*rubiphila*, Patch). No infection was obtained in experiments in which *Amphorophora rubicola*, Oestl., *A. rubi*, Kalt., or *A. sensoriata*, Mason, was used [*cf.* *R.A.E.*, A, xv, 667]. More experiments should be made before definite conclusions are drawn regarding the possibility of transmission by *Amphorophora rubicola*, but it is almost certain that if the other two species of the genus are capable of transmitting curl they do so very rarely. All stages of *Aphis rubicola*, including the winged form, transmitted the disease; the winged form is considered to be very important in long distance dissemination.

ALDRICH (J. M.). **Notes on the Types of American two-winged Flies of the Genus *Sarcophaga* and a few related Forms described by the early Authors.**—*Proc. U.S. Nat. Mus.*, lxxviii, art. 12, no. 2855, 39 pp., 3 pls. Washington, D.C., 1930.

This paper gives the results of an investigation of the identity of American species of *Sarcophaga* described by early authors, based on a study of the types. The species dealt with include *S. haemorrhoidalis*, Mg. (*georgina*, Wied.), *S. rapax*, Wlk. (*Helicobia helicis*, Towns.), *S. barbata*, Thoms. (*falculata*, Pand., *argentina*, Brèth.), *S. setulosa*, Wulp (*cimbicis*, Towns.) and *S. lambens*, Wied. (*sternodontis*, Towns.). *S. claripalpis*, Wulp, is a Dexiid, referable to the genus *Paratheresia*, and *P. signifera*, Towns., is a synonym of it [*cf.* *R.A.E.*, A, xviii, 677].

DE AZEVEDO (A.). **Um coleoptero nocivo do Tamarindeiro na Bahia, *Calandra* (*Sitophilus*) *linearis*, Herbst.**—*Correio agric.*, viii, no. 8, p. 223. Bahia, August 1930.

Calandra linearis, Hbst., has been observed boring into the pods of *Tamarindus indicus* in Bahia [*cf.* *R.A.E.*, A, ix, 183].

GONDÉ (H.). **Les parasites du blé. Comment les reconnaître. Comment s'en défendre.**—*Bull. Ass. Nat. Vallée du Loing*, vi, no. 1–2, pp. 59–87, 10 refs. Moret-sur-Loing, 1923. [Recd. 1930.]

This key to the insect pests and diseases of wheat in France deals with 83 insects listed according to the part of the plant attacked. Short accounts are given of methods of treatment for their control.

CÁNOVAS GARCÍA (C.). **Método de fumigación por el ácido cianhídrico líquido.** [Fumigation with Liquid Hydrocyanic Acid.]—*Bol. Agric. téc. econ.*, Secc. doctrinal, Bol. téc., xxii, no. 260–261, pp. 345–350. Madrid, 1930.

Liquid hydrocyanic acid was first used for the fumigation of *Citrus* on a commercial scale in California in 1917 and in Spain in 1924. The method of fumigation is described, with data relating to its application for controlling various Coccids in Spain.

Melis (A.). **Contribuzione alla conoscenza degli insetti dannosi alle piante agrarie e forestali della Sardegna.** [A Contribution to the Knowledge of Insects injurious to the agricultural and forest Plants of Sardinia.]—*Redia*, xviii, pp. 1–120, 7 figs., 32 refs. Florence, 1930.

This is the first part of a paper designed to collate existing information on insect pests in Sardinia and deals with those attacking ligneous plants. It is divided into five parts dealing respectively with the pests of vines, olives (including a full account of the author's observations in superintending campaigns with bait-sprays against *Dacus oleae*, Gmel., from 1925 to 1928), *Citrus*, other fruit trees, and forests, notes being given on the bionomics and natural enemies of the more important species.

Melis (A.). **Cinque anni di lotta antidacica in Sardegna.** [Five Years of Work against the Olive Fly in Sardinia.]—*Redia*, xviii, pp. 401–407. Florence, 1930.

This is a résumé of the information on work against *Dacus oleae*, Gmel., given in the preceding paper.

Del Guercio (G.). **Le ricerche e le esperienze di Puglia dal 1910 al 1914 contro la Mosca delle Olive con accenno a rilievi in altre contrade d'Italia (1915-1928).** [Investigations and Experiments in Puglia from 1910 to 1914 against the Olive Fly, with Observations in other Regions of Italy (1925–1928).]—*Redia*, xviii, pp. 171–399, 1 fig. Florence, 1930.

The work against *Dacus oleae*, Gmel., described here was mainly based on the use of bait-sprays containing sodium arsenite. A great many baits for these sprays were tested, but sugar-beet molasses proved the best, because it attracts the fly, but not bees or other Hymenoptera. The best results are obtained by repeating the spray and supplementing it by the use of similar baits applied in trap-pans and on bundles of twigs. The more concentrated solutions are more attractive.

Carbone (D.). **La vaccinazione dei Bachi da Seta.** [Immunisation of the Silkworm.]—*Rend. Ist. Lombardo*, (2) lxii, no. 1–5, pp. 138–142, 2 pls., 1 ref. Milan, 1929. [Recd. October 1930.]

Feeding silkworms [*Bombyx mori*, L.] on leaves treated with vaccines containing the entire microflora of silkworms affected with flacherie and grasserie results in a decreased mortality from these two diseases. The immunity is specific.

Marcus (B. A.). **Beiträge zur Anatomie und Biologie des Messingkäfers** (*Niptus hololeucus* **Fald.).** [Contributions to the Anatomy and Biology of *N. hololeucus*.]—*Mitt. Ges. Vorratsschutz*, vi, nos. 4–5, pp. 47–49, 62–63, 2 figs. Berlin, July, September 1930.

The anatomy of the point of junction of the Malpighian vessels with the intestine in *Niptus hololeucus*, Fald., is briefly discussed.

Breeding experiments in Munich gave the following average durations of the various stages (which vary with the temperature) : egg, 16 days ; larval feeding, 60 ; construction of pupal case, 30 ; pupal stage, 20 ; rest of adult in pupal case, 23 ; maturation feeding, 25. Oviposition occurs over a period of 3–5 weeks, except when prolonged by lack of food, a female laying 25–30 eggs, usually singly. In the absence of suitable material eggs are deposited in rotting wood, wool, etc., but the young larvae soon die. The larvae feed on various starchy substances, such as bran, cacao, etc. No feeding occurs on wood or peat in either the larval or adult stage. After oviposition the adults usually die in 2–3 months. There appear to be two generations a year in Germany.

ZACHER (F.). **Käfer an Tapiokawurzeln.** [Beetles in Tapioca Roots.] —*Mitt. Ges. Vorratsschutz*, vi, no. 5, pp. 53–56, 2 figs., 11 refs. Berlin, September 1930.

The dried roots of cassava (*Manihot utilissima*) are imported into Germany from various countries for the preparation of various forms of tapioca. Hitherto scarcely any pests have been recorded from them, but recently seven species of beetles were found in one consignment, *viz.*, *Sinoxylon* sp., probably *S. anale*, Lesne, *Calandra oryzae*, L., *Laemophloeus ferrugineus*, Steph., *Latheticus oryzae*, Waterh., *Necrobia rufipes*, DeG., *Araecerus fasciculatus*, DeG., and *Rhizopertha dominica*, F. Only the last two were present in abundance.

KUNIKE (G.). **Holzzerstörende Bienen.** [Wood-destroying Bees.]—*Mitt. Ges. Vorratsschutz*, vi, no. 5, pp. 60–61, 6 refs. Berlin, September 1930.

Eriades nigricornis, Nyl., is recorded as boring into a window frame in Berlin, contrary to statements in the literature that it cannot infest sound timber.

ŞUSTER (P. M.). **Contributions à l'étude des Tachinaires en Roumanie.**—*Ann. sci. Univ. Jassy*, xvi, no. 1–2, pp. 57–249, 47 refs. Jassy, March 1930.

This is a list of 187 Tachinids occurring in Rumania, with morphological and biological notes on each and the name of the host when known.

BORCEA (I.). **Rapport sur les insectes nuisibles à l'agriculture en Roumanie et moyens employés pour les combattre.**—*Ann. sci. Univ. Jassy*, xvi, no. 1–2, pp. 263–276, 3 pp. refs. Jassy, March 1930.

A list is given of the insects attacking cultivated plants and forest trees in Rumania, with short notes on control measures.

Borcea (I.) & Şuster (P.). **Ravages causés en Roumanie par la chenille russe :** *Loxostege* (*Phlyctaenodes*) *sticticalis* **L. Ennemis naturels. Moyens à employer pour combattre ce fléau.**—*Ann. sci. Univ. Jassy*, xvi, no. 1–2, pp. 277–298, 4 pls., 1 fig., 5 refs. Jassy, March 1930.

In 1929 a very serious outbreak of *Loxostege sticticalis*, L., occurred in Rumania on field and market garden crops, which were entirely destroyed in some districts. Successive generations of adults were observed in the second half of May, in July and from 20th August to mid-September, but those of the last generation appeared to be sterile, since neither eggs nor larvae were afterwards found. In the authors' opinion the most effective control of *L. sticticalis* is by means of parasites, and an annotated list is given of those bred from it. These include the Ichneumonids, *Eulimneria xanthostoma*, Grav., *Cremastus decoratus*, Grav., *Lissonota parallela*, Grav., and *Pimpla viduata*, Grav., the Braconid, *Chelonus* sp., and the Tachinids, *Nemorilla floralis*, Fall., and *Zenillia* (*Tritochaeta*) *pullata*, Mg. The measures suggested include the use of trap-crops on which the moths will oviposit, and trap trenches to destroy the migrating larvae.

[Shchegolev (V.).] **Щеголев (В.). Grain Sawflies (Biology, Ecology and Control).** [*In Russian.*]—Demy 8vo, 120 pp., 30 figs., 90 refs. Moscow, " Sel'khozgiz," 1930.

This paper deals at length with the bionomics and control of *Cephus pygmaeus*, L., and *Trachelus tabidus*, F., in the northern Caucasus, much of the information given having already been noticed [*R.A.E.*, A, xvi, 60, etc.]. Studies carried out from 1925 to 1929 showed that *T. tabidus* is the less injurious species, probably because it appears later than *C. pygmaeus*, when autumn-sown wheat is too advanced for it to attack. In infested plants the grain loses in weight and tends to become dry and brittle. Early sown wheat and barley or early maturing varieties are more resistant to infestation, and the injury done is inversely proportional to rainfall and soil moisture. The percentage of infestation is considerably higher in fields that are manured, as the thicker stemmed plants are preferred. Severe and snowless winters, with fluctuating temperatures, kill large numbers of the larvae and sometimes result in a marked decrease in infestation.

In addition to the control measures already noticed [xvi, 61], ploughing in the stubble is recommended ; experiments are described showing that the number of adults emerging decreases in proportion to the depth of the ploughing, which is particularly effective in dry soil.

Brief notes are given on the biology of *Collyria puncticeps*, Thoms., which is the chief parasite of *C. pygmaeus* and to a less extent attacks *T. tabidus*, the percentage of parasitism of both these species being sometimes as high as 34. The adults appear 5–7 days earlier than those of the hosts, and subsequently oviposit in their eggs in the stems of the cereals. The infested eggs give rise to larvae that do not differ from unparasitised ones ; they hibernate and spin cocoons in the spring, in which the larvae of the parasite pupate. It is suggested that *C. trichophthalma*, Thoms., and *C. iberica*, Schmdk., may also attack the sawflies ; a key to these three species of *Collyria* is given.

Other parasites reared from infested stubble were *Arthrolysis* (*Picroscytus*) *scabricula*, Nees, which emerged chiefly in June, only a few individuals appearing in August, and *Microbracon* (*Bracon*) *abscissor*, Nees (*regularis*, Wesm.). Each host cocoon contained 2 or 3 cocoons of the latter parasite, but on the whole the percentage of parasitism was very low. In one instance two individuals of *Eupelmus* sp. were reared, and in the laboratory the larvae were often killed by mites.

[Radugin (P.).] **Радугин (П.). Notes on the Control of** *Schistocerca gregaria*. [*In Russian.*]—*Khlopkovoe Delo*, ix, no. 4–5, pp. 591–595. Tashkent, 1930.

In March 1930 swarms of yellow, sexually mature individuals of *Schistocerca gregaria*, Forsk., were recorded in southern and central Persia ; their northward movement was retarded by cold weather. The territories of the Russian Union are threatened by locusts passing through the Khorossan Province of Persia or through Persian Azerbaijan ; swarms from the latter had already penetrated into the Ordubad Region (Transcaucasia) on 15th May.

The extensive use of poison baits and spraying the newly hatched hoppers, which do not readily feed on baits, with soap emulsion, are recommended.

[Siyazov (M. M.) & Kharin (S. A.).] **Сиязов (М. М.) и Харин (С. А.). Instructions for the Control of** *Schistocerca gregaria*, **the migratory or desert Locust.** [*In Russian.*]—Demy 8vo, 42 pp., 30 figs., 1 ref. Tashkent, Nauchno-Issled. Inst. Khlopkovod. i khlopkov. Promuishl., Ent. Byuro, 1930.

In late May and June 1930, Russian Central Asia, as far north as the Aral Sea, was invaded by swarms of *Schistocerca gregaria*, Forsk., coming from northern Persia and Afghanistan. Oviposition lasted for about a month ; the eggs, of which there were 70–120 in an egg-pod, were deposited principally in light soft soils, particularly where moisture was present. In cotton fields the density of oviposition sometimes reached 500 egg-pods per sq. ft. An outline of the biology of *S. gregaria* and descriptions and figures of the five larval and the adult stages are given.

Schistocerca has at least two generations a year in Persia. Eggs are deposited in January and early February in the Provinces of Fars and Baluchistan, either by the local wintering locusts, or by those crossing the Persian and Oman Gulfs from the Arabian Peninsula. Hoppers hatch and develop in February-March ; the adult stage is reached in late March, and in April winged swarms migrate northward as far as Khorossan and Central Asia, where they oviposit in May–June. The hoppers, which hatch in 15–20 days, mature during the summer, and return southward in August-September. It is probable that another generation is produced in the south during the winter rains.

The usual control measures and the methods by which hoppers crossing irrigation canals can be caught are discussed. It was noticed that when poison baits are scattered at night-time near a place where locally bred adults are passing the night, the latter descend from the trees and feed on the baits.

[**New Insect Pests in South Africa.**]

Wood borers recently sent to the Imperial Institute of Entomology for identification are *Lyctus brunneus*, Steph., from *Eucalyptus*, and the Scolytid, *Hylastes opacus*, Er., from unbarked *Pinus radiata* (*insignis*), both from George, Cape Province. Neither of them has apparently been previously recorded from South Africa.

Dupont (P. R.). **Entomological and Mycological Notes.**—*Ann. Rep. Dept. Agric. Seychelles 1929*, pp. 6–8. Victoria, Seychelles, 1930.

Pinnaspis buxi, Bch., and *Ischnaspis longirostris*, Sign. (*filiformis*, Dougl.) have spread to such an extent during the past few years in two islands that it is no longer possible to keep them in check by cutting down the infested leaves and burning them ; they are now much the most important of the Coccids attacking coconut in Seychelles [*cf. R.A.E.*, A, xiv, 229, 523]. In view of the successful results obtained in Fiji with *Cryptognatha nodiceps*, Mshl., introduced from Trinidad for the control of *Aspidiotus destructor*, Sign. [xvii, 733, etc.], it is thought probable that this Coccinellid, if introduced into Seychelles, would be of value against *P. buxi* and *I. longirostris*. The possibility of using various entomogenous fungi for their control is being considered. *Pseudomicrocera henningsii* is known to attack *A. destructor* in Sierra Leone [xvii, 352], but not *P. buxi* and *I. longirostris*, and spores of this fungus sent to Seychelles by the Imperial Mycological Institute failed to develop in these scales.

Commun (R.). **Travaux d'entomologie.**—*Bull. écon. Indochine*, xxxiii, no. 3 B, C.R. Trav. 1928–29, ii–Ent. Cryptog., pp. 1–28, 2 pls. Hanoi, 1930.

Notes are given on insect pests in Indo-China studied in 1928 and 1929, with suggestions for their control in some cases. The Pentatomid, *Scotinophara* sp., is very injurious to rice in several of the western provinces of Cochin China. It can be controlled by flooding the fields to a depth of 6 to 8 ins. above the normal and by cutting down the stalks after the rice harvest. A considerable proportion of the eggs is parasitised, and it is hoped to rear the parasites for distribution. *Nephotettix bipunctatus*, F., is a minor pest of rice. Lepidopterous pests observed in April 1928 were larvae of *Cnaphalocrocis medinalis*, Guen., and of *Chilo simplex*, Butl., found on plants on the banks and in the stubble left from the crop ; and adults [*sic*] of the Nymphalid, *Precis atlites*, Johansson, in or on the stalks of rice, and of *Utetheisa pulchella*, L., on *Heliotropium indicum* along the banks. The last-named has been experimentally reared on rice leaves. In Annam, the young plants are infested by a Noctuid, probably *Spodoptera mauritia*, Boisd., which periodically causes heavy damage ; collection of the eggs and flooding with water covered with a film of kerosene into which the larvae can be shaken is recommended. Coleoptera include the Galerucids, *Ceratia* (*Aulacophora*) *palliata*, Schall., and *Rhaphidopalpa* (*A.*) *foveicollis*, Luc. ; these can also be successfully treated by the above method. All rice stubble and wild plants on the banks should be destroyed after the crop is taken. Maize is heavily infested by the rice weevil, *Calandra oryzae*, L., oviposition occurring on the grains both before and after the crop is gathered. Fumigation with

carbon bisulphide or sulphur for 48 hours is recommended; more potent fumigants are not suitable for use by native growers. If the maize heads are hung on a line in direct sunlight, the weevils leave them and can be caught on small trap plots of maize or rice in the vicinity.

Coffee pests include *Coccus* (*Lecanium*) *viridis*, Green, the Cossid, *Zeuzera coffeae*, Nietn. (red borer) and in north Annam a Scolytid, probably *Xyleborus coffeae*, Wurth, which infests the smaller branches.

Hevea is attacked by the Cerambycid, *Ceresium flavipes*, F. (*simplex*, Gyllh.), which infests the trunks of young trees, and various weevils, including *Desmidophorus breviusculus*, Hbthl., *Astycus lateralis*, F., and *Sipalus granulatus*, F., occur in young plantations in small numbers. The Tenebrionid, *Crypticus nebulosus*, Fairm., is sometimes found under the diseased bark of unhealthy trees, and the Bostrychid, *Xylothrips flavipes*, Ill., is abundant in dead ones.

Tea is infested in Annam by a bug, possibly *Helopeltis* sp., and by Gryllids, including *Brachytrypes* sp., which also attacks many other plants. Cotton is damaged by *Dysdercus* sp., and the leaves are attacked by the Pyralid, *Sylepta derogata*, F., and a Halticid, resembling *Podagrica* (*Nisotra*) sp. Sugar-cane pests in Cochin China include *Pseudococcus* spp. and *Diatraea* sp., which often kills the younger plants.

Kapok trees in various parts of Cochin China are attacked by *Dysdercus cingulatus*, F.; the Curculionids, *Alcides scenicus*, Fst., *A. obesus*, Fst., *Hypomeces squamosus*, F., *Onychopoma* sp., and *Desmidophorus breviusculus*; the Melolonthids, *Apogonia splendida*, Boh., and *Homaloplia ruricola*, F.; the Elaterid, *Conoderus capucinus*, Cand.; the Halticid, *Podagrica semirufa*, Kust.; and *Zeuzera coffeae*.

Miscellaneous pests include the Satyrid, *Amathusia phidippus*, Johanssen, on banana and young oil palms [*Elaeis guineënsis*]; *Prodenia litura*, F., which attacks tobacco and is favoured by the moisture and shade resulting from dense planting; and the Galerucid, *Luperus lividus*, Joann., and the Meloid, *Epicauta insularis*, Haag, on *Sesbania grandiflora*. Coffee berries in storage have been compulsorily disinfected in Saigon with turpentine; the results indicate that the germination of the seed is slightly retarded by this treatment but not otherwise affected.

Glover (P. M.). **Entomological Aspects of Lac Research in India.**—*Bull. Ent. Res.*, xxi, pt. 3, pp. 261–266, 1 pl. London, October 1930.

With a view to the ultimate improvement in quality and quantity of lac produced, a study of the Coccid, *Laccifer* (*Tachardia*) *lacca*, Kerr., has been undertaken, and notes are given on its bionomics. The more important host-trees used for lac cultivation in India are *Schleichera trijuga* (kusum), *Butea frondosa* (palas), *Zizyphus jujuba* (ber), *Z. xylopyra* (ghont) and *Acacia catechu* (khair).

It is estimated that at least 60 per cent. of the potential crop of lac is damaged by insect predators and parasites. The most important predator is the larva of the Noctuid, *Eublemma amabilis*, Moore, which is itself attacked by *Elasmus claripennis*, Cam., *Brachymeria tachardiae*, Cam., and *Microbracon* (*Bracon*) *tachardiae*, Cam. (the two latter are ectoparasites of the larva and endoparasites of the pupa), the ants, *Camponotus compressus*, F., and *Solenopsis geminata rufa*, Jer., and *Ephestia* sp., which feeds on the larvae in stored crops. The larva of

the Tineid, *Holcocera pulverea*, Meyr., also causes extensive damage to lac. It is attacked by the two above-mentioned ants, *Brachymeria tachardiae*, *Apanteles tachardiae*, Cam. (which also parasitises the larva of *Ephestia* sp.), an unidentified Chalcid, an Ichneumonid and a Bethylid. *Apanteles fakhrulhajiae*, Mahdn., another Braconid and an Ichneumonid have been collected from lac, and it seems probable that they are parasites of lac predators. The Eulophid, *Tetrastichus purpureus*, Cam., is a definite parasite of *L. lacca*, and also of another Eulophid, *Coccophagus tschirchii*, Mahdn., and the Encyrtid, *Tachardiaephagus tachardiae*, How., which are both parasites of lac. The Eupelmid, *Brasema annulicaudis*, Cam., is a parasite of *L. lacca*, *Microbracon tachardiae*, *Apanteles tachardiae*, and a Cercopid, *Machaerota planitiae*, Dist., which feeds on the host-trees of the genus *Zizyphus*. A spotted Encyrtid and a black Encyrtid are parasitic on lac, the former also attacking *Aspidiotus* and *Chionaspis*, which are pests of some of the host-trees. Two species of yellow Encyrtids that have been collected from lac in small numbers are suspected of being parasitic on *L. lacca*. Various species of ants are associated with lac; some of these attack the larvae of predators and some pick up the crawling larvae and males of *L. lacca*. Certain beetles are found among dead lac cells, and it seems probable that they are scavengers.

A list is also given of the most prevalent species of insects attacking the host-trees of lac.

WILKINSON (D. S.). **New Braconidae and other Notes.**—*Bull. Ent. Res.*, xxi, pt. 3, pp. 275–285, 2 figs. London, October 1930.

The Braconids dealt with include: *Spinaria spinator*, Guér., from the Limacodid, *Setora nitens*, Wlk., in Malaya; *Fornicia africana*, sp. n., from a Limacodid on coffee in Southern Rhodesia; *Apanteles insolens*, sp. n., from an unknown host in Cape Province, South Africa; *A. coffea*, sp. n., from the Pyralid, *Thliptoceras octoguttalis*, Feld., on *Tricolysia* and from a Lepidopterous borer, possibly this species but more probably *Argyroploce* (*Enarmonia*) *batrachopa*, Meyr., on coffee in Uganda; *A. earterus*, sp. n., from *Earias insulana*, Boisd., and *Diparopsis castanea*, Hmps., in Anglo-Egyptian Sudan; *A. baoris*, sp. n., from the Hesperiids, *Parnara* (*Baoris*) *mathias*, F., and *P.* (*B.*) *bada*, Moore, on rice in Malaya; *A. thurberiae*, Mues., from *Platyedra gossypiella*, Saund., in Trinidad; *Microgaster botydis*, sp. n., from "*Botys marginalis*" (possibly *Psara marginalis*, Warren, or *Pycnarmon marginalis*, Snellen) in Sumatra; *M. austrina*, Wilkn., from a larva in a maize cob in Uganda; and *M. tomentosae*, sp. n., from a Pyralid defoliating *Terminalia tomentosa* in the United Provinces, India. The Ichneumonids discussed are *Mesostenus basimacula*, Cam., of which *M. mimeticus*, Cam., is a synonym; and *Osprhynchotus kingi*, sp. n., from an unknown host in the Anglo-Egyptian Sudan.

The genus *Xanthomicrogaster* was erected for two new species, *X. fortipes*, Cam. (the type), and *X. ruficollis*, Cam., of which the former is referable to *Microgaster* and the latter to *Apanteles*.

BOX (H. E.). **A new Moth Borer of Sugar-cane in Argentina (Lepidoptera: Pyralidae).**—*Bull. Ent. Res.*, xxi, pt. 3, pp. 307–308, 1 pl. London, October 1930.

Diatraea dyari, sp. n., a species of moth borer damaging sugar-cane in Argentina [*R.A.E.*, A, xvii, 24, 303] is described. Additional

parasites recorded from it are a species of *Prophanurus*, probably new, that attacks the eggs, and the Dexiid, *Paratheresia claripalpis*, Wulp, which is the most important natural enemy of the larvae of both this species and of *D. saccharalis*, F., in Argentina. Several species of fungi have been observed infesting the larvae and pupae of *D. dyari*.

Myers (I. H.). **Notes on Parasites of the Gall-midge (*Jatrophobia brasiliensis*, Rübs.) of Cassava in Trinidad.**—*Bull. Ent. Res.*, xxi, pt. 3, pp. 309–313, 2 refs. London, October 1930.

A detailed account is given of observations on the process of oviposition in two Chalcids, *Aprostocetus fidius*, Gir., and a metallic blue species of the same genus, parasitic on the larvae and pupae of the gall-midge, *Jatrophobia brasiliensis*, Rübs., which attacks cassava (*Manihot utilissima*) in Trinidad.

Rohdendorf (B.). **Records of Sarcophagidae with new Species.**—*Bull. Ent. Res.*, xxi, pt. 3, pp. 315–318, 3 figs. London, October 1930.

The Sarcophagids dealt with include *Sarcophaga sinica*, sp. n., and *S. sera*, sp. n., from China; and *Blaesoxipha* (s. str.) *filipjevi aequatorialis*, subsp. n., reared from *Schistocerca gregaria*, Forsk., and *Anacridium moestum*, Serv., in Tanganyika Territory. As all the individuals of *Sarcophaga destructor*, Malloch, examined from Cyprus and the Sudan were bred from tomato, figs, or melons, it is doubtful whether previous records in which it is stated to be a parasite of *Schistocerca gregaria* are correct.

Barnes (H. F.). **Gall Midges (Cecidomyidae) as Enemies of the Tingidae, Psyllidae, Aleyrodidae and Coccidae.**—*Bull. Ent. Res.*, xxi, pt. 3, pp. 319–329. London, October 1930.

In this paper, which is the second of a series on the zoophagous Cecidomyiids of the world [*cf. R.A.E.*, A, xviii, 199], three further instances of gall-midges attacking Aphids are recorded. An annotated list is given of the Cecidomyiid larvae that have been reported to prey on Tingids, Psyllids, Aleurodids and Coccids, as well as alphabetical lists of the latter insects showing the Cecidomyiids attacking them and the country in which the observations were made.

Barnes (H. F.). **A new Thrips-eating Gall Midge, *Thripsobremia liothripis*, gen. et sp. n. (Cecidomyidae).**—*Bull. Ent. Res.*, xxi, pt. 3, pp. 331–332, 1 fig. London, October 1930.

The Cecidomyiid, *Thripsobremia liothripis*, gen. et sp. n., which is predacious on *Liothrips urichi*, Karny, in Trinidad [*cf. R.A.E.*, A, xviii, 616], is described.

Myers (J. G.). ***Carabunia myersi*, Waterst. (Hym., Encyrtidae), a Parasite of nymphal Froghoppers (Hom., Cercopidae).**—*Bull. Ent. Res.*, xxi, no. 3, pp. 341–351, 1 fig., 6 refs. London, October 1930.

During 1929 a detailed study of the biology of the Encyrtid, *Carabunia myersi*, Wtrst., was undertaken with a view to its possible utilisa-

tion against *Tomaspis* (*Monecphora*) *saccharina*, Dist. (sugar-cane froghopper) in Trinidad [*cf. R.A.E.*, A, xvii, 155].

The following is largely taken from the author's summary: *C. myersi* is an efficient internal parasite of the nymphs of *Clastoptera undulata*, Uhl., and *Clastoptera* sp. on various ornamental shrubs and trees in Cuba and of a third species of this genus on *Fuchsia* in the mountains of Haiti, the rate of parasitism varying from 65 to nearly 100 per cent. Dissection and experiment showed that it is not actually a parasite of froghoppers of the genus *Tomaspis*, nor is it likely to become one if introduced into Trinidad. The eggs are laid in nymphs of about the second instar, the females running over the spittle masses and stabbing them repeatedly with the ovipositor. There are three larval stadia, and pupation takes place within the indurated larval skin of the last larval instar, inside the abdomen of the still active host. The spiracles of this puparium achieve connections with certain of the abdominal tracheae of the host and by this means supply air to the pupa.

FERRIÈRE (C.). **Notes on Asiatic Chalcidoidea.**—*Bull. Ent. Res.*, xxi, pt. 3, pp. 353–360, 8 refs. London, October 1930.

Descriptions are given of: The Perilampid, *Perilampus microgastris*, sp. n., from *Microgaster indicus*, Wlkn., *Apanteles machaeralis*, Wlkn., and a Braconid parasite of *Nephantis serinopa*, Meyr., in India, from *Lamprosema diemenalis*, Guen., in Malaya and from *Apanteles* sp., parasitic on *Tirathaba* spp., in Java; the Eupelmids, *Anastatus menzeli*, sp. n., and *A. menzeli* var. *obscurus*, n., from the eggs of *Attacus atlas*, L., in Java; the Pteromalids, *Agiommatus attaci*, sp. n., from the eggs of *Attacus atlas* in Malaya and Java, and *Trigonogastra brunneicornis*, sp. n., from the pupa of a species of *Agromyza* that mines the stems of *Hibiscus esculentus* in Ceylon; the Elasmid, *Elasmus corbetti*, sp. n., from *Cnaphalocrocis medinalis*, Guen., in Malaya; and the Eulophids, *Euderus malayensis*, sp. n., from the larva of *Prays endocarpa*, Meyr., in Malaya, and *Trichospilus pupivora*, gen. et sp. n., from *Nephantis serinopa* in India, from the pupae of *N. serinopa*, *Thosea cervina*, Wlk., *Spodoptera mauritia*, Boisd., and a Tachinid parasite of *Nacoleia annubilata*, Swinh., in Ceylon, from *Tirathaba rufivena*, Wlk., in Malaya, and from the pupae of *Tirathaba* spp. in Java. *Secodella*, Girault, is shown to be a synonym of *Euderus*, Hal.

BRYANT (G. E.). **Some new injurious Phytophaga from Somaliland and Uganda.**—*Bull. Ent. Res.*, xxi, pt. 3, pp. 361–363, 3 figs. London, October 1930.

The three Halticids described include *Sebaethe guavae*, sp. n., on *Psidium* in Italian Somaliland.

DAVIDSON (J.) & BALD (J. G.). **Description and Bionomics of** *Frankliniella insularis* **Franklin (Thysanoptera).**—*Bull. Ent. Res.*, xxi, pt. 3, pp. 365–385, 7 figs. London, October 1930.

During 1929 certain aspects of the bionomics of *Frankliniella insularis*, Frankl., in Australia were investigated in detail, particularly on tomato plants under greenhouse conditions, and are here recorded together with many of the earlier observations published in a paper already noticed [*R.A.E.*, A, xviii, 666].

The following is taken from the authors' summary: *F. insularis* is found on various food-plants, including tomatos, in the Adelaide area. The various stages of the insect are described. The eggs are laid in the tissues of the tomato leaf, and the larvae feed on the leaves or in the flowers. Pupation usually occurs in the upper layers of the soil or in débris on the surface, though it sometimes takes place in rolled leaves, in depressions in the stem, etc. On carnations the eggs were laid in the tissues of the sepals and petals. The rate of oviposition is affected by temperature, one female laying an average of 3·9 eggs a day with a mean daily temperature of 77·5° F., and another an average of 1·3 with a mean temperature of 67·7°. Below 60° the rate of oviposition is greatly retarded, but egg-laying may extend over a long period; one female oviposited over a period of 157 days. The greatest number of eggs laid by a single female was 92 over a period of 70 days. The duration of the complete life-cycle varied from 13 to 41 days with mean temperatures ranging from 89·5 to 64·1° F. *F. insularis* is common in the Adelaide area during the warmer period of the year (approximately November to April) and rare or absent during the remaining months. Its seasonal occurrence appears to be due to temperature, since it was easily reared at all times of the year on tomatos in greenhouses.

THORPE (W. H.). **Observations on the Parasites of the Pine-shoot Moth,** *Rhyacionia buoliana,* **Schiff.**—*Bull. Ent. Res.*, xxi, pt. 3, pp. 387–412, 8 figs., 16 refs. London, October 1930.

The following is taken largely from the author's summary: During a preliminary study of the parasites of *Rhyacionia buoliana*, Schiff. (pine-shoot moth) in England begun in 1928, 28 species of primary and secondary parasites were obtained. Thirteen of these were represented by not more than two individuals and are probably of little economic importance. The Pteromalids, *Habrocytus acutigena*, Thoms., and *Eutelus mediterraneus*, Mayr, are definitely hyperparasites, and at least two of the Ichneumonids, *Pimpla ruficollis*, Grav., and *P. brevicornis*, Grav., may live as hyperparasites under certain conditions. The more important of the remaining species are *Orgilus obscurator*, Nees, *Cremastus interruptor*, Grav., *Omorgus mutabilis*, Holmg., *O. borealis*, Zett., *O. ensator*, Grav., *Eulimneria rufifemur*, Thoms., *Microbracon discoideus*, Wesm., and *Pimpla examinator*, F. The first three appear to be the dominant parasites and were introduced into Canada against *R. buoliana*, and the first two have become established there. A brief account is given of the salient facts in the biology of each species, and the more important diagnostic characters of the adults are described to facilitate identification. The mature larvae of the commoner species are described in detail, with the object of finding satisfactory specific characters. Of the common species the majority attack the larvae. *Pimpla examinator* is the only true pupal parasite that is at all common, but *Omorgus mutabilis* and *Orgilus obscurator*, although they are essentially larval parasites, frequently remain in their host and complete their development after it has pupated. One egg parasite, *Trichogramma evanescens*, Westw., was obtained in small numbers. None of the common species is confined to *R. buoliana*, and there is no reason to suppose that the other species, about which less is known, are any more specific. Five of the species reared are new to Britain, and eighteen constitute new records for this host.

Roark (R. C.). **The American Market for Tuba Root** (*Derris elliptica*). —*Malayan Agric. J.*, xviii, no. 9, pp. 455–458, 10 refs. Kuala Lumpur, September 1930.

Work on the chemical and insecticidal properties of rotenone and other constituents of derris root, etc., is briefly reviewed [*R.A.E.*, A, xvii, 450 ; xviii, 376, etc.]. Rotenone has been proved to be highly toxic to insects but not poisonous to man and domestic animals. The methods of extracting it by means of ether or acetone are described. The cost of transport would be reduced to about one-fourth if the rotenone were extracted at the place where the roots were grown. Acetone is a convenient solvent for extracting the rotenone and other insecticidal constituents of derris root on a large scale ; with ether the risk of fire is much greater. The species of *Derris* that have been shown to possess insecticidal properties due to rotenone are *D. elliptica*, *D. chinensis*, *D. malaccensis*, *D. philippinensis*, *D. thyrsiflora* and *D. uliginosa* [*cf.* xviii, 578]. It may be possible to develop a variety of one of these plants that would contain more rotenone than the species now available commercially.

Liebermann (J.). **La lucha de insectos contra insectos y su aplicación práctica en la defensa del hombre y de sus industrias.** [The Struggle of Insects against Insects and its practical Application in the Defence of Man and his Industries.]—*5. Reun. Soc. argentina Pat. reg. Norte, Jujuy, 1929*, ii, pp. 1186–1208. Buenos Aires, 1930.

This is a brief account of the general principles of biological control, with instances of its application against insect pests both in Argentina and other parts of the world.

Stirrett (G. M.). **Some preliminary Observations of the Flight of the European Corn Borer.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 46–51, 1 graph. Toronto [? 1930].

Studies of the period of and factors affecting the flight of *Pyrausta nubilalis*, Hb. (European corn borer) were carried out at Chatham, Ontario, in 1927, 1928 and 1929. The average height of the maize, on the experimental plot, varied little from year to year. Observations were made each hour of the evening and night throughout the whole flight season, the moths being caught in a net for 15 minutes and the temperature, relative humidity, evaporation, precipitation, wind and pressure recorded.

The flight season during the three years lasted 28–31 days, the commencing dates varying from 4th to 8th July and the closing dates from 31st July to 9th August. There were six nights in 1927 when the moths were entirely absent, nine in 1928 and six in 1929. The total number of moths observed was 258 in 1927, 370 in 1928 and 108 in 1929. The compulsory clean-up of maize refuse and an increase in the acreage under cultivation were thought to be mainly responsible for the reduction in their numbers. The great majority of the moths found were females. They began to fly about 8.30 p.m. and reached their maximum numbers about 9.30 p.m. Under certain conditions a secondary flight took place between 2 and 4 a.m.

The data available are inadequate fully to explain the absence of the moths from the field, but low temperature was undoubtedly the controlling factor on several occasions, whereas precipitation may have been responsible for their absence in other cases, although they fly in light rains. Neither relative humidity, evaporation, pressure nor wind appeared to have any definite influence over flight, but no extremes in these factors were encountered. It is almost certain that no moths will be found at a temperature below 57° F.

CAESAR (L.). **Progress Report on Corn Borer Control.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 54–56. Toronto [? 1930].

An account is given of the manner in which the control of *Pyrausta nubilalis*, Hb., under the Corn Borer Act [*R.A.E.*, A, xvii, 394] was carried out in Ontario in 1929, when a cold and wet spring retarded farm operations and frequent rains hardened the soil to such an extent that toothed cultivators, which drag more stubble to the surface, had to be used instead of disks. This necessitated more hand-picking. In spite of these difficulties, the results secured were even better than in 1928. A table showing the percentage of stalk infestation in 1927, 1928 and 1929 indicates an average decrease of 50 per cent. in 10 out of 15 counties. In two counties there was no real decrease, and in the remaining three, which had been less thoroughly cleaned up in the previous spring, there was an increase. The use of a low-cutting attachment for maize binders is advised with the object of reducing the necessity for hand-picking to a minimum.

HERMAN (F. A.). **Some Problems of a Chemical Nature of Interest to the Entomologist.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 59–63, 5 refs. Toronto [? 1930].

Methods are described for the analysis of arsenicals for water-soluble arsenic, and for the determination of the nature of the electrical charge in poison dusts, and a number of constants are enumerated and defined for use in the examination of petroleum oils for spray purposes.

Several brands of calcium arsenate that were found to be very low in water-soluble arsenic when examined by the official method caused severe foliage injury, whereas other brands found by the same method to be measurably high in soluble arsenic caused no foliage injury. The samples were again examined for soluble arsenic, this time incorporating 1 gm. of the arsenate in a 3–10–50 Bordeaux mixture and subjecting the mixture to carbon dioxide aspiration. The very high percentage of soluble arsenic liberated from the brands first mentioned by this method indicated that they were not stable arsenates, but rather a mixture of lime and arsenic acid, so that, as the lime became carbonated after contact with the air and the plant, arsenic was set free and foliage injury resulted.

GORHAM (R. P.). **Injury to Potatoes by Larvae of** *Agrotis ypsilon* **Rott.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 63–65. Toronto [? 1930].

Agrotis ypsilon, Hfn., attacked potato plants, turnips and sunflowers at Fredericton, New Brunswick, during the first two weeks of July 1929. The injury was caused by the almost mature larvae, a few pupae being

found on 12th July. Adults began to emerge on 19th July and continued to appear through August and September. Average counts made on six farms at different places showed 7·5 per cent. of the potato plants injured, and observations in autumn showed the weight of tubers produced by injured plants to be reduced by 39–65 per cent.

SEAMANS (H. L.). **Experiments on the Control of the Wheat Stem Sawfly by Parasites.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 65–67. Toronto [? 1930].

In the course of field observations of *Cephus cinctus*, Nort., carried on in Alberta, the cocoons of *Microbracon cephi*, Gahan [*cf. R.A.E.*, A, xi, 458] were first found in cut wheat stubs in 1925. The adults begin to emerge towards the end of June, when those of *C. cinctus* are diminishing, and oviposition seems to begin at once, the eggs being probably laid directly on the sawfly larvae in the stem. The larvae are external feeders. There are apparently two generations annually, the first pupating late in July. The adults emerge about the end of the first week in August and start the second generation, which does not attack the sawfly larvae until after the wheat stems have been cut and plugged by them. The larvae then pupate in cocoons deep in the cut stubs, where they hibernate. The adults apparently congregate among the plants on which sawfly larvae are most abundant, where the percentage of parasitism has invariably been found to be higher.

An experiment was carried out to determine the possibility of forcing the parasites to move into wheat where the infestation by *Cephus* was 15–25 per cent. by cutting part of an adjacent stand of *Agropyrum smithi* 90 per cent. infested soon after the middle of July when adults of *M. cephi* were abundant. A control area with nearly identical conditions was established at some distance. Examination of the experimental grass areas about 3 weeks later showed 98·3 per cent. parasitism in the uncut plot and 11·8 per cent. in the control. The wheat, when examined the following spring to determine the percentage of second generation parasites, showed 48·85 and 4·36 per cent. parasitism respectively, indicating that the parasites from the area of destroyed grass had spread to other infested stems. The high parasitism in the grass plot that was left bears out the view that the parasites are attracted to heavy sawfly infestations. Field observations show that adult sawflies oviposit in any well-developed stem, native grass being the more heavily infested because in normal years it develops ahead of the wheat. It is therefore concluded that the lack of parasites in wheat is mainly due to comparatively light sawfly infestations. In another experiment self-sown wheat was 62 per cent. infested with sawfly larvae and wheat adjacent to it and not quite so well developed was 31 per cent. infested. Adults of *M. cephi* were present in the self-sown wheat on 12th July, and it was destroyed three days later. The seeded wheat when examined 3 weeks later and again in the following spring showed 30·9 per cent. parasitism by the first generation and 14 per cent. by the second, when control wheat showed 4·36 per cent. The lower percentage of second generation parasites was probably due to the fact that the adults moved farther into the field in search of live sawfly larvae.

Although the cutting of plants infested with sawfly larvae early in the season killed the larvae, the parasites matured and emerged.

HUDSON (H. F.) & WOOD (A. A.). **The Life-history of the White Cutworm,** *Euxoa scandens* **Riley.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 67–70. Toronto [? 1930].

The occurrence of *Lycophotia* (*Euxoa*) *scandens*, Riley, in western Ontario appears to be confined to a type of soil consisting of fine, dark, grey-brown sand, acid in reaction, and containing a small proportion of organic and colloidal matter. In and around blow-holes in this sandy soil are ridges of lime-like material, which is strongly alkaline in reaction and contains practically no organic matter. Here the true soil has been eroded away by wind action, exposing the unweathered substratum which is highly calcareous. Cultivated land was found to be the most suitable larval habitat, cutworms being seldom present in grass land. Oviposition is less frequent in potato fields than in maize fields, and sweet clover fields appear to be the most favoured. The eggs are found just below the surface of the soil from about the middle of July until the first week in August. Larvae can be found from the end of July ; they hibernate, usually in the fifth or sixth instar, and resume feeding in spring. They feed at, or slightly above or below, the surface and have a wide range of food-plants, although they appear to prefer sweet clover. Pupae are present from about 20th June till 3rd July, and the moths are in flight from early July to the first week in August. The only flowering plant observed to be visited by the moths is milkweed (*Asclepias syriaca*), with the bloom of which their flight period closely corresponds. The moths feed from 8·30–11 p.m., after which they oviposit.

Parasitism begins early in the autumn and gradually increases, until between late May and early June it may reach 43 per cent. Two Hymenopterous parasites and one Tachinid have been reared, the most abundant being *Berecyntus bakeri*, How. Many of the larvae are probably devoured by birds. They may be effectively controlled by poison bran baits, the best results being secured when the evening temperature is about 60° F. The destruction of all milkweed plants in the vicinity also appears advisable.

MCLAINE (L. S.) & GLENDENNING (D.). **The Spread and Distribution of the Satin Moth in British Columbia.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 71–73, 1 ref. Toronto [? 1930].

The introduction and subsequent spread of *Stilpnotia salicis*, L., in western British Columbia are briefly reviewed [*R.A.E.*, A, xiii, 191 ; xviii, 343]. In addition to several species of poplars and willows already recorded as attacked, *Populus tremuloides*, *Salix sitchensis* and *S. scouleriana* were defoliated in large numbers by this moth in 1928. Apart from the importance of *S. salicis* as a pest of *P. trichocarpa*, which is valuable for veneers, boxes and pulpwood, the moth is liable to be carried into the interior and even to the prairies, where willows and poplars are used effectively as windbreaks. A regulation was passed on 12th April 1928 prohibiting the movement of all species of *Salix* and *Populus* from the coastal area beyond a number of fixed points.

A detailed account is given of the results of scouting work carried out in 1929. Observations of artificial means of dispersion showed that *S. salicis* in the coastal area is attracted to steamer lights. The moths were found in the saloons and staterooms of steamships, deck freight or stacked lumber also affording them shelter. They were

also carried on motor cars, and it has been shown that trains travelling eastwards through the mountain passes and high winds sweeping through the canyons are important factors in their distribution. One mountain barrier has already been passed.

SHEPPARD (R. W.). **The European Pine-shoot Moth** (*Rhyacionia* (*Evetria*) *buoliana* **Schiff.**) **in the Niagara Peninsula.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 73–76. Toronto [? 1930].

An account is given of measures carried out in the Niagara Peninsula from 1926 to 1929 in an endeavour to stamp out a serious infestation of *Rhyacionia buoliana*, Schiff. In addition to scouting and infestation record work, vigorous eradication measures were instituted, involving the pruning off and destruction of all infested buds. Very heavily infested pines were cut down and destroyed. In 1926 2·6 per cent. of 15,300 pines examined were infested; in 1927 1·9 per cent. of 19,789; in 1928 1·3 per cent. of 25,059; and in 1929 less than 0·4 per cent. of 36,639.

Near Niagara Falls, *R. buoliana*, instead of confining its attentions to the younger and low-growing trees, is infesting older pines quite freely, including *Pinus sylvestris* up to 35 years of age, and sometimes *P. strobus*, 16 and 20 years old, this species being very rarely attacked in the Niagara Peninsula. This infestation of the larger pines beyond the range of pruning is likely to constitute breeding centres for numbers of moths, even though the trees themselves may not be materially affected. It is almost entirely confined to the immediate vicinity of the Horseshoe Falls, the heaviest infestation being in plantations of somewhat large pines subject to frequent and prolonged drenchings from the spray. Although parasitism by native Hymenopterous parasites was not uncommon among the larvae of *R. buoliana* attacking pines in the nurseries in one district, the scarcity of parasitised larvae or pupae in the Niagara Falls area indicates that natural control is not here an important factor. About 120 individuals of *Cremastus interruptor*, Grav., and 20 of *Orgilus obscurator*, Nees, were liberated among pine plantations near the Horseshoe Falls on 20th July 1928, but there has been no definite record of the recovery of either parasite. Although moths have emerged in captivity from collected pupae as early as 13th June, they usually emerge during the last week of June and first week in July, and a great effort has been made to complete eradication work before that time.

BIRD (R. D.). **Notes on the Fir Sawfly** *Neodiprion abietis* **Harris.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 76–82, 1 fig., 27 refs. Toronto [? 1930].

This account of the bionomics of *Diprion* (*Neodiprion*) *abietis*, Harr., an important pest of the foliage of conifers in eastern Canada and the New England States, is based upon studies carried on during 1924–26 in Manitoba, supplemented by notes from the literature. Food-plants from which this sawfly has been recorded in injurious numbers include balsam fir (*Abies balsamea*), pitch pine (*Pinus rigida*), jack pine (*Pinus banksiana*), white pine (*Pinus strobus*), white spruce (*Picea canadensis*) and black spruce (*Picea mariana*). It is probably found throughout the greater part of the range of its food-plants, but an outbreak in injurious numbers is usually local.

For the purposes of observation adults were caged in glass vials with fresh sprigs of spruce, where oviposition, which is described, and mating could be closely studied. Overwintering eggs were watched in the spring for date of hatching, and observations on the larvae were continued on the trees and in small rearing cages. The immature stages are described in detail. The larvae hatch about May. Like those of *D.* (*N.*) *lecontei*, Fitch, they are gregarious in feeding and congregate in small groups soon after hatching within the general colony upon individual needles, usually four to a needle, into which they eat deeply. Normally needles of the new growth are attacked, but sometimes also those of the previous year within which the eggs were laid. In the third instar only one or two larvae are found on a needle when feeding; this they eat completely to within about an inch of the base. When not feeding, the whole colony congregates in a dense group upon the uneaten needles. The eggs having been laid on the tips of the twigs at a height of 2–10 ft. from the ground, the colonies move back along the branch as they strip it. Two or more colonies may unite to form groups of 80 or more individuals, which strip a whole area of the tree. When full-fed, the larvae scatter and seek places among the needles where they spin their cocoons. The date of hatching and the length of the larval stage vary according to weather conditions, the average larval period under natural conditions being 50 days. No indication of a second brood was observed, but it is possible that one may occur further south.

The adults emerge in August. Females caged in glass vials readily oviposited, one egg being laid in each of 30 or 40 adjoining needles. Parasites are not sufficiently plentiful in Manitoba to prevent the occurrence of outbreaks of this sawfly, but spraying with lead arsenate has been found to be effective against the larvae.

SPENCER (G. J.). **Insect Pests (or Insect Allies) that have recently arrived in Vancouver District, British Columbia. 1928-1929.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 82–84. Toronto [? 1930].

Possible first records for the Vancouver district during 1928–29 include a mite resembling *Paratetranychus pilosus*, C. & F., which occurred in the autumn of 1928 and increased in numbers on young elms in the following spring. It feeds almost entirely on the lower surface of the leaves and hibernates in the egg stage on the twigs and upper part of the trunk. *Depressaria heracleana*, DeG., caused serious damage to parsnip plants intended for seed, feeding on the leaves and seed heads in the crown, among which it pupated. The larvae are heavily parasitised by a small Tachinid. *Plutella maculipennis*, Curt., which had been present in the Frazer Valley for a number of years, occurred for the first time in Vancouver in limited numbers, and *Gracilaria syringella*, F. (lilac leaf-miner) has also just reached the western edge of the city. A renewed outbreak of *Diarthronomyia hypogaea*, Lw., which was stamped out some years ago, occurred in greenhouses in 1929, its attacks being very marked on certain varieties of chrysanthemums. Attacks of *Phytomyza chrysanthemi*, Kow., on chrysanthemum became apparent for the first time in greenhouses in 1929.

Sitotroga cerealella, Ol., was introduced in an exhibition case of maize imported from Idaho and became established on buckwheat in

the laboratory in 1928. It was subsequently found at a distillery infesting large bins of maize reported to have come from South America. *Borkhausenia pseudospretella*, Staint., and *Endrosis lacteella*, Schiff., have been present in barns for two years. The larvae were found in chop bins, which they leave when full grown and migrate to the roof-beams where they pupate. *Thermobia domestica*, Pack., is recorded as infesting laundries and *Scutigera forceps*, Raf., from an abbatoir. *Peronea variana*, Fern., *P. variegana*, Schiff., and *Ellopia fiscellaria*, Gn., none of which is new to British Columbia, have caused great damage to hemlocks [*Tsuga*] in the Vancouver district during 1929, the first two also attacking spruce and to a less extent Douglas fir [*Pseudotsuga taxifolia*]. Mushrooms have been infested by *Tyroglyphus lintneri*, Osb., which has not been hitherto recorded from the mainland, although it has occurred for three years on Vancouver Island, and by a Podurid, possibly *Achorutes* sp.

DIAMOND (V. R.). **The Biology of** *Nemeritis canescens*, **a Parasite of the Mediterranean Flour Moth.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 84–89. Toronto [? 1930].

The following is taken mainly from the author's summary : *Nemeritis canescens*, Grav., is a parthenogenetic Ichneumonid parasite of the Mediterranean flour moth [*Ephestia kühniella*, Zell.], a serious pest of the milling industry in Canada and the United States. The method by which this parasite, which is hardy and easily reared in large numbers, was bred in the laboratory at Chatham, Ontario, is described in detail. Development from egg to adult under laboratory conditions requires an average of 21·5 days. There are 5 larval instars, and the adult female lives on an average about 54 days and is very prolific. Males are not known. Oviposition occurs throughout a wide range of temperature, and in the dark as well as in the light. The adults live well on sugar and water, but do not appear to be able to utilise flour as food. They do not feed on the host larva. No parasites were obtained from *N. canescens* during this work, and it survived a heavy infestation of mites with much less mortality than was expected.

Observations on material of *E. kühniella* from Ontario and British Columbia showed very heavy infestations of *N. canescens* in some cases, indicating that it might be able to establish itself in very large numbers under average milling conditions in Canada. Although this parasite cannot be expected to give complete control of *E. kühniella*, it should be a very valuable auxiliary to chemical control measures.

THOMPSON (R. W.). **An Outbreak of Mycetophilid and Chironomid Larvae in a large commercial Greenhouse.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 96–99, 3 figs. Toronto [? 1930].

Injury caused to the roots of various plants, including sweet peas, *Statice*, *Iris* and *Ranunculus*, in a large commercial greenhouse in Ontario early in January 1929 was found to be due to the larvae of the Chironomid, *Camptocladius byssinus*, Schr., and the Mycetophilid, *Sciara caesar*, Johannsen. *S. prolifica*, Felt, was also present, but only

in small numbers. In badly infested iris bulbs large areas of tissue were decayed by an organism that gained entrance through the areas eaten by the larvae. Feeding above ground was only observed in the case of *Statice* crowns. Larvae of *S. caesar* were only numerous in sweet peas and *Ranunculus* of which the larger roots were rotted in consequence of attack by *C. byssinus*, and they may have been merely feeding on decaying vegetable matter, but in iris bulbs and *Statice* crowns the two species were more evenly divided and *S. caesar* was in some cases in the majority. Both were found in large numbers in the soil and were more numerous in areas where dried blood had been applied as a fertiliser. All stages of both species are described. The eggs of *C. byssinus* are deposited in masses varying from 12 to 250, usually adhering to the under surface of a fragment of soil. The immature larvae are often found in clusters, although this has never been observed among the mature ones nor in the case of *S. caesar*, the eggs of which are laid singly in the soil. Pupae of both species occur near the surface of the soil, except where moisture is lacking, when they are sometimes found at lower levels. The pupal stage of *C. byssinus* was found to last 7 days and that of *S. caesar* 8. In cages, adults of *C. byssinus* lived 1 or 2 days and those of *S. caesar* up to 10. At 58–60° F. the egg stage was found to last 6–8 days in the case of *C. byssinus* and 7½–8½ days in the case of *S. caesar*.

Mercury bichloride at the rate of 1 oz. to 7 gals. water, poured on the soil in sufficient quantities to moisten it as far down as the larvae occurred, killed all eggs, larvae and pupae. Paradichlorobenzene scattered over the soil at the rate of 2 lb. to 100 sq. ft. did not kill more than 20 per cent. of the larvae, but when it was covered with 2 inches of soil all eggs, larvae and pupae were killed. This treatment can only be applied to unplanted ground at least 4 weeks before plants are introduced. Tobacco dust applied as a covering about ⅜ in. deep all over the soil immediately after thorough wetting will kill the newly emerging flies and prevent those that have emerged from ovipositing. As it prevents cultivation and watering, this insecticide can only be applied as a temporary measure. Steam sterilisation of the soil destroys all stages present.

Gibson (A.). **Two Insects destructive to Iris.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 100–102, 7 refs. Toronto [? 1930].

Notes are given on a small weevil, *Mononychus vulpeculus*, F., and *Argyroploce hebesana*, Wlk., which have recently become serious pests of iris grown commercially in Ontario. The distribution of both species in North America is given. The adults of *M. vulpeculus*, which are described, feed on the seed pods, as many as 12–20 punctures having been found in a single pod, though neither eggs nor larvae were ever present. Glass vials inverted over the seed pods have been successfully used as a protection against the beetles.

The larvae of *A. hebesana*, which are briefly described, were found in the seed capsules of iris on 1st July 1929. The moths have been found in Ontario from the middle of May until the end of August, but no definite data have been obtained as to the number of generations a year. In Ottawa, the pupal period lasted 16–18 days in spring. Other information given in regard to the bionomics and control of this moth has already been noticed [*R.A.E.*, A, iii, 659 ; xvii, 720].

Painter (R. H.). **The Tarnished Plant Bug** *Lygus pratensis* **L.: A Progress Report.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 102–107, 5 refs. Toronto [? 1930].

Observations on the life-history of *Lygus pratensis*, L., carried out in Ontario since 1925 [*R.A.E.*, A, xv, 667] show that hibernation occurs in the adult stage in approximately equal numbers of both sexes in various types of shelter on the ground, preference being shown for areas furnishing the deepest cover. On uncleared land there was found to be a gradual increase in the numbers of bugs to the acre of from 20,000 to 180,000 based on counts made in areas of 100 sq. ft. from early October to the middle of November, the increase being paralleled by a decrease in numbers on golden-rod, upon which there is a concentration in early autumn. Under the most favourable circumstances only 40–60 per cent. of the adults survive the winter, mortality being much higher where the covering is scanty. Emergence from hibernation takes place in early spring, individuals being often encountered in April at a temperature as low as 46° F. During cold periods they retire again to the basal leaves of biennials and perennials, moving out again in warmer weather. The food-plants of the over-wintered bugs cover a considerable range owing to the long period over which they are present and include red and black currant, in addition to a number of ornamental trees, shrubs and flowering plants, a list of which is given.

Fertilisation takes place early in the spring, and 90 per cent. of the females are ready to oviposit in early May. The oviposition period covers a period of about 50 days, and the eggs hatch in about 18 days. Only four plants have been added to the list of those used for oviposition given in the paper already noticed [*loc. cit.*], namely, tall buttercup (*Ranunculus acris*), garden pink (*Dianthus* sp.), *Cerastium tomentosum* and rock cress (*Arabis alpina*). At the end of June, there is a period of about 3 weeks during which the overwintering and spring generations overlap. The nymphs require about 3 weeks to reach maturity. A key to the instars of the nymphs is given. The adults of the spring generation begin to appear about the end of June, reach their maximum towards the end of July and remain in the field in large numbers until the end of August, when a rapid decrease coincides with the appearance of the generation that finally overwinters. Oviposition by the spring generation begins in the first week in July and continues until the end of August, the eggs hatching in about 12 days.

The most commonly found and most abundant parasite of *L. pratensis* is a Hymenopterous larva resembling that of *Eulimneria* (*Limnerium*), which has been found infesting about 10 per cent. of both adults and nymphs, and is present in the host from mid-June to late July and again from mid-August until early September. There are probably two generations, one attacking the early nymphs of the spring generation of the host and occurring in the first adults to reach maturity, and a second attacking the early nymphs of the summer generation but apparently causing the death of the host before it reaches the adult stage, as no parasitic larva has been found in the adults of this brood. Other parasites of *L. pratensis* are the Mymarid, *Polynema pratensiphaga*, Walley, which is comparatively rare [xviii, 22], a Tachinid, *Alophora opaca*, Coq., which attacks 2–4 per cent. of the overwintering generation in the late summer, hibernates within the host as a partially grown larva and emerges from it in the spring to pupate in the soil; and a Mermithid, *Hexamermis* sp. [xix, 16].

Experiments have also been carried out to determine the phototropic and chemotropic responses of *L. pratensis*, and lists are given of the colours and odours most likely to attract the bug. Four applications each of a number of contact insecticides in both spray and dust form were made at weekly intervals during July and August 1929 with no apparent effect upon the amount of injury to plants from *L. pratensis*.

Dustan (G. G.). **Preliminary Notes on the Mortality and Feeding Habits of newly hatched Oriental Peach Moth Larvae.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 108–111, 1 ref. Toronto [? 1930].

The results are given of one season's work carried out at St. Davids, Ontario, to determine the mortality of newly-hatched larvae of the oriental peach moth [*Cydia molesta*, Busck] and the types of injury caused. The eggs are usually laid on the lower surface of peach leaves, and the larvae chiefly attack the tips of the twigs in the early part of the season and the fruit from the time it forms until it is picked. In the early part of the season, the larvae may start a feeding hole directly after hatching, but at midsummer they may first wander over the leaves for as long as 16 hours. When starting a tunnel, the larva spins a few fine threads and then removes particles of the tissue, laying them to one side in the web. When the tunnel is about as deep as the head of the larva, it stops discarding particles and begins to feed.

Batches of 5 eggs each on pieces of paper or leaves were pinned, when almost ready to hatch, to the under surface of a peach leaf, and a band of adhesive was placed round the stem about 1 ft. from the end of the shoot to prevent the larvae from escaping. The shoots were examined 3–7 days after the eggs hatched and the mortality was determined from the number of hatched eggs and the number of live larvae. The average mortality was 74·2 per cent. for the season (minimum 30·4, maximum 94·6). The food-plant offers a varying resistance through the season, which increases up to the last week in August and drops off as the fruit ripens. Average daily temperatures over 78° F. and below 55° F. were detrimental to the newly-hatched larvae. Types of injury are divided into early summer injury, characterised by abundant twig injury and some fruit injury ; midsummer injury, characterised by some twig injury, abundant injury on the woody stems of the fruit and also large gum masses on the sides of the peaches from the entrance holes made by partly grown larvae ; and late summer injury when twig injury is scarce, gum masses are absent and small clean holes are found in the skin of the fruit.

Ross (W. A.), Hall (J. A.) & Armstrong (T.). **Experiments with Larvicides directed against overwintering Codling and Oriental Peach Moth Caterpillars.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 111–116. Toronto [? 1930].

An account is given of small scale spraying experiments carried out in a greenhouse in Ontario in 1927, 1928 and 1929 with 22 different materials in an endeavour to secure a penetrating wash for the destruction of the larvae of the codling and oriental peach moths [*Cydia pomonella*, L., and *C. molesta*, Busck] wintering in their cocoons, which

at the same time could be used with safety on apple and peach trees. Some of the more promising larvicides were also tested under orchard conditions, but in no case were the results obtained satisfactory.

Ross (W. A.), Armstrong (T.) & Patterson (D. F.). **Some Oriental Peach Moth Control Studies with special Reference to the Use of Lime and Talc Sprays.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 116–124, 3 figs., 2 refs. Toronto [? 1930].

Studies on the control of the Oriental peach moth [*Cydia molesta*, Busck] were carried out in Ontario in 1929 with the object of ascertaining the ovicidal, larvicidal and deterrent value of hydrated lime, talc and some other materials. In two series of experiments the combined ovicidal and larvicidal value of the insecticides was determined by placing twigs with eggs on the foliage, coated thoroughly with the sprays, in small jars containing water and transferring them subsequently to cans in which fruit was placed for the larvae that survived. Among the materials tested, hydrated lime sprays used in doses up to 25 lb. to 40 gals. were most effective and consistent in their behaviour, an average of 78 per cent. mortality being obtained without the addition of Volck oil, and 87 per cent. with the addition of 1–2 pints of the latter, as compared with 35 per cent. in the controls. Poor results were secured with the talc sprays, the average mortality in 12 tests being only 52 per cent.

Further experiments in which peaches completely covered with the various sprays were exposed to newly-hatched larvae indicated that lime and talc are of little value in preventing larval entrance. An experiment in which sprayed twigs closely coupled with unsprayed twigs were left in oviposition cages showed that none of the materials prevented the deposition of a considerable number of eggs. Another series of tests showed the following materials among others to possess some ovicidal value : 1 per cent. Volck or white oil-pyrethrum, 10 per cent. boiler compound, and to a less extent, hydrated lime. Observations showed clearly that many newly-hatched larvae are destroyed by becoming entangled in spray particles when crawling over foliage treated with lime, talc, mica or calcium carbonate. Talc is valueless as an ovicide, and the value of hydrated lime in this capacity is apparently due to its desiccating qualities.

The first application in orchard experiments in spraying and dusting with hydrated lime and talc was made at a period corresponding with the maximum emergence and oviposition of the spring brood moths, but preceding hatching. Subsequent applications, varying from 2 to 5 in number, were made at different dates in June, July and August. The results were decidedly disappointing, and spray residue was sometimes troublesome. When peach trees received 5 applications at weekly intervals from the end of May to 28th June, using 25 lb. talc or hydrated lime, $\frac{1}{4}$–$\frac{1}{2}$ lb. calcium caseinate and 40 gals. water, a reduction in twig injury was secured as long as the coating of spray was maintained, but the difference between the sprayed and unsprayed plots rapidly diminished as the materials were washed off and new growth appeared, infestation being practically uniform by 9th August. Throughout the season no evidence of foliage injury or growth stimulation due to heavy coatings of lime and talc on the trees was observed, though slight injury to the foliage of seedling peach trees was caused elsewhere in one case by applications of 25 lb. lime to 40 gals. water.

STEENBURGH (W. E.). **Notes on the natural and introduced Parasites of the Oriental Peach Moth** (*Laspeyresia molesta* **Busck) in Ontario.** —*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 124–130, 1 ref. Toronto [? 1930].

The investigations in 1928 on the native parasites of *Cydia* (*Laspeyresia*) *molesta*, Busck, in Ontario, and the possibilities of utilising *Trichogramma minutum*, Riley, to reduce its numbers [*R.A.E.*, A, xviii, 122] were further developed in 1929, when *Macrocentrus ancylivora*, Rohw., collected in southern New Jersey was introduced [xviii, 494]. Good results in the colonisation of *T. minutum* were secured by sealing small round cards containing parasitised eggs into the bottom of a waxed paper cone 3½ ins. across the bottom and 5 ins. high, with a short ribbon attached near the apex. The cones are attached to the branch by a tack through the ribbon, and the parasites are allowed ready access to the trees on emerging from the host eggs by clipping off the apex of the cone. Predators cannot readily enter the cone, which is not damaged even when blown from the tree. The colonisations were made at the maximum oviposition of each generation. The experiments indicate that little is to be gained from colonisation in first generation eggs, but a good establishment of *T. minutum* may be secured by liberations during the second generation, as eggs of *C. molesta* are continually present from this time onwards. Only a small number of parasites could be liberated for the third generation eggs, as the host material (*Sitotroga* [*cerealella*, Ol.]) had been completely destroyed in the laboratory by an infestation of *Pediculoides ventricosus*, Newp., but a third generation examination in orchards where liberations had been made during the previous generations showed a marked increase of *T. minutum*. Orchards containing late heavily infested varieties of peach showed a parasitism of between 40 and 72·6 per cent. with an even distribution of the parasites. The results obtained were promising on the whole.

MCLAINE (L. S.). **The Mediterranean Fruit Fly Situation in Florida.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 133–137, 8 refs. Toronto [? 1930].

The recent outbreak of the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.] in Florida is reviewed from the literature, and the history of the fly in other parts of the world is briefly outlined. A general outbreak of *C. capitata* in Canada would be unlikely to occur, and any sporadic infestation would undoubtedly disappear with the first signs of winter.

HALL (J. A.). **Leaf Rollers attacking the Apple in Norfolk County, Ontario.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 137–139. Toronto [? 1930].

In preliminary observations in Norfolk County, Ontario, in 1929, the following leaf-rollers, mentioned in order of abundance, were found in apple orchards : *Tortrix* (*Archips*) *semiferana*, Wlk., which was by far the most abundant, *T.* (*Pandemis*) *limitata*, Rob., *T.* (*A.*) *argyrospila*, Wlk., *T.* (*A.*) *rosaceana*, Harr., *T.* (*A.*) *fractivittana*, Clem., *Amorbia humerosana*, Clem., and *Eulia quadrifasciana*, Fern. Adults of *T.* (*A.*) *purpurana*, Clem., were also taken in the orchard. They oviposited on apple leaves, upon which the resulting larvae fed, entering hibernation

in the third instar. *T. fractivittana* and *A. humerosana* constitute new records for the district under observation. Nearly all the larvae of *T. limitata* collected in the orchard were found in the old nests of *Eucosma* (*Spilonota*) *ocellana*, Schiff. [*cf. R.A.E.*, A, xvii, 92], or in mines vacated by *Bucculatrix pomifoliella*, Clem.

The chief means of dissemination is by the flight of the adults, but the eggs or larvae may be carried in nursery stock, and very young larvae are often carried by the wind for some distance on silken threads.

None of the larvae was found feeding on weeds or grasses in the orchards. *T. argyrospila* was reared from larvae taken on apple, witch hazel [*Hamamelis*] and sweet cherry ; *T. semiferana*, *T. fractivittana* and *A. humerosana* from apple only ; *T. rosaceana* from apple, witch hazel, syringa, lilac, *Sassafras* and St. John's wort [*Hypericum*] ; and *T. limitata* from apple and witch hazel.

Shortly after the buds begin to burst, the larvae, the feeding habits of which were quite similar in early summer, enter the opening leaflets and begin feeding on the interior, spinning the leaves together. Larvae hatching later roll the expanded leaves and feed inside. The larvae bore into the fruit buds when they are ready to burst and feed on the floral structures, the buds being frequently so webbed that the bloom cannot open. When the fruit begins to form, it also is attacked and large or small areas are eaten out of it, severely injured fruits dropping prematurely and slightly injured fruits becoming deformed. Those species that hibernate as larvae do considerable injury to the leaves in autumn and eat small round holes in the fruit. *T. argyrospila* and *T. semiferana* winter in the egg stage, and *T. rosaceana* and *T. limitata* as third instar larvae in hibernaculae in the axils of twigs, under bud scales and in crevices in the bark. *A. humerosana* is said to winter as a pupa in Pennsylvania, but it is not known how it or *T. fractivittana* winters in Ontario. The larvae begin to emerge from the eggs or winter quarters soon after the buds begin to burst and are all out by the time the calyces are closed. The larvae of *T. argyrospila* and *T. semiferana* mature and pupate in late May and June and give rise to adults from mid-June to mid-July. The adults live from one to two weeks and there is only one generation a year. The larvae of *T. rosaceana* mature about the same time, giving rise to adults in June and July. The eggs are laid on the leaves within a few days and produce a second generation, the second brood moths emerging in September. *T. limitata*, which is single brooded, is somewhat slower in maturing than the other species, the adults not appearing until July and August.

Of 365 miscellaneous leaf-roller larvae collected at random during May, 81 or 22 per cent. were parasitised, and 40 out of 100 larvae collected on 27th June were parasitised. *Zenillia caesar*, Ald., *Phorocera erecta*, Coq., and 8 or 9 undetermined species of Hymenoptera were reared from the larvae.

CAESAR (L.). **A new Orchard Pest in Ontario.**—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 140–141. Toronto [? 1930].

Hemerophila (*Simaëthis*) *pariana*, Clerck, is recorded from Ontario, where it was first discovered on 17th August feeding on the foliage of apple. As it was subsequently found to be widely distributed, it had probably been present for 3 or 4 years. In Ontario *H. pariana* has been found only on apple and hawthorn [*Crataegus*], its favourite food-plants in the United States, where it also occurs on pear and

has been recorded from sweet cherry. The injury observed was limited almost entirely to the foliage of the terminal twigs, and none of the trees except one hawthorn had more than 1–5 per cent. of the foliage attacked. The almost mature larva, the pupa and adult, the only stages seen, are briefly described. It is thought probable that there are only two generations annually in Ontario, the larvae of the first being present in May and June and those of the second in July, August and September. Adults from the latter generation were emerging from the end of August till at least 20th September. As *H. pariana* is known to be readily controlled by lead arsenate, the regular pink and calyx sprays will kill the first brood, but are not sufficient to control the second. No larvae were found, however, in an orchard that had been sprayed early in July.

RUHMANN (M. H.). **Report of Assistant Entomologist, Vernon.**—*24th Ann. Rep. Br. Columbia Dept. Agric. 1929*, pp. 39–42. Victoria, B.C., 1930.

Insects occurring during 1929 in British Columbia included *Lygus pratensis*, L., which attacked orchards in the Okanagan Valley before the buds opened, causing an average loss to all fruits of 15 per cent., and as much as 80 per cent. on one variety of apple ; *Cydia* (*Carpocapsa*) *pomonella*, L., which is steadily spreading and against which a programme of oil sprays is suggested ; and *Eriosoma* (*Schizoneura*) *lanigerum*, Hausm., which in conjunction with perennial canker [*cf. R.A.E.*, A, xvii, 666] is causing increasingly serious injury to apple.

HAEUSSLER (G. J.). **Parasites of the Oriental Peach Moth,** *Laspeyresia molesta* **Busck, in North America.**—*J. Agric. Res.*, xli, no. 5, pp. 365–377, 3 figs., 6 refs. Washington, D.C., 1st September 1930.

A list is given of 57 species of primary parasites (5 of which are doubtful) and 8 species of secondary parasites recorded from *Cydia* (*Laspeyresia*) *molesta*, Busck, in North America, showing the locality from which each species has been recorded, the stage of the host attacked, and the relation of the parasite to it. Few of the parasites appear to be of much importance, with the exception of *Trichogramma minutum*, Riley, which attacks the eggs, and *Macrocentrus ancylivora*, Rohw., and *Glypta rufiscutellaris*, Cress., which attack the larvae, particularly those of the earlier generations in peach twigs.

Records of parasites of the larvae occurring in the vicinity of Riverton, New Jersey, were obtained by making weekly collections of peach twigs infested with larvae of *C. molesta*, and rearing these larvae to maturity. *T. minutum* was the only parasite found that develops entirely within the egg of the host. *Ascogaster carpocapsae*, Vier., and *Phanerotoma tibialis*, Hald., oviposit in the egg but complete their development in the larva. During the four years 1925–28, 91 per cent. of the parasites of the larvae were *Macrocentrus ancylivora* and parasitism by this species alone averaged 48·23 per cent.

Seasonal parasitism of the larvae by all the species combined varied from 60·81 per cent. in 1926 to 44·55 per cent. in 1928, with an average of 52·89 per cent. for the four seasons. Parasitism as high as 95 per cent. occurred in weekly collections of larvae in 1925 and 1926. *M. ancylivora* emerges early enough in the spring to attack the first larvae

of *C. molesta* that feed in peach twigs. In each season parasitism was most prevalent when larvae of *C. molesta* were most abundant in the twigs. Parasitism of the larvae of the first and second broods caused a decided decrease in the number of twigs infested in each season. Of the larvae feeding in peach fruit in the early part of the season 28 per cent. were parasitised by *M. ancylivora* and 7 per cent. by *M. delicatus*, Cress., but less than 2 per cent. of the wintering larvae feeding in peaches late in the autumn were parasitised. About 4 per cent. of the larvae feeding in quince fruit at harvest time were parasitised, *Phanerotoma tibialis* being the most abundant parasite. Parasitism by *Glypta rufiscutellaris* was more prevalent in these larvae than in larvae feeding in twigs. *Aenoplex betulaecola*, Ashm., was the most common parasite of the stages within the cocoon. Disease caused a high mortality among larvae of *C. molesta* hibernating in cocoons spun under quince bark.

Mediterranean Fruit Fly Quarantine. Notice of lifting Quarantine no. 68.—*U.S. Dept. Agric., P.Q.C.A.*, multigraph 4 pp. Washington, D.C., 11th November 1930.

It has been determined by the Secretary of Agriculture, as the result of intensive field inspection work, that there is at the present time no known infestation by *Ceratitis capitata*, Wied. (Mediterranean fruit-fly) in Florida or elsewhere in the continental United States. Quarantine no. 68, placed on the movement of fruit, vegetables, etc., in consequence of the recent infestation by *C. capitata* in Florida, and its amendments [*R.A.E.*, A, xviii, 547, etc.] are therefore removed as from 15th November 1930. Intensive field inspection will, however, be continued indefinitely both in respect of fruit in groves and in packing houses, and eradication work will be instituted immediately in the event of discovery of the fly. A brief account is given of the successful campaign against *C. capitata*, on which the Federal Government has expended approximately £1,256,000. The latest infestation recorded was found on 25th July 1930 and comprised two pupae recovered from the soil under the fruit of a sour orange. In compliance with the Federal regulations there has been an almost complete removal and disposal of dropped fruit throughout the citrus-growing areas of Florida.

British Honduras. Proclamation no. 3, 1930.—*Br. Honduras Gaz.*, 6th September 1930, reprint 1 p.

The importation into British Honduras of all fruits and vegetables capable of carrying *Ceratitis capitata*, Wied., is prohibited as from 3rd September 1930, except from the British Isles and Canada, when accompanied by a certificate stating that such products are home-grown, and from the United States when accompanied by a certificate stating that they are the produce of a State in which *C. capitata* does not exist.

[Pyatnitzkiĭ (G. K.).] **Пятницкий (Г. К.). Materials for the Study of the Bark Beetles of the Spruce Forests of the Poshekhon'e District in the Yaroslavl Government.** [*In Russian.*]—*Plant Protection*, vi, no. 5–6, pp. 595–629, 5 refs. Leningrad, 1930.

This paper is an attempt to trace the relation existing between the type of forest and the associations of bark-beetles occurring in

it. It includes a list of 37 species of Scolytids observed in 1928 in the Yaroslavl Government in a spruce forest, the type of which is discussed at length. Notes are given on the economic importance of each species, the stage in which it was found, other beetles associated with it, and the age and condition of the trees attacked. The author considers his conclusions to be of a preliminary nature.

[NIKOLAEVSKIĬ (L. A.).] **Николаевский (Л. А.). Report on a Study of the Biology of** *Euxoa segetum* **Schiff. under local Conditions of Khiva.** [*In Russian.*]—*Plant Protection*, vi, no. 5–6, pp. 631–645, 1 diagr. Leningrad, 1930.

Field observations and breeding experiments, carried out from March to November 1927 in Khiva where *Euxoa segetum*, Schiff., is an important pest of cotton, indicate that it probably has three generations a year. In the insectary the average number of eggs laid by a female was 267 a day or 900 in all. The maximum life of the moth was 13 days. In summer the egg stage lasted 3–4 days. The larval stage varied from 17 to 55 days. The larvae feed during the night, the preferred food-plants being *Convolvulus arvensis*, cotton, and cucurbits. Cotton sown about the end of April was more severely injured than that sown earlier, as it was in a susceptible stage when the larvae of the spring generation were larger.

Cotton sown as late as the first half of May was uninfested, as the appearance of the shoots coincided with the time when the larvae pupate. The pupal stage lasted 15–16 days in the spring and summer, and about 20 days in the autumn. The Tachinid, *Cnephalia hebes*, Fall., was very abundant in the field throughout the summer till mid-September, and about 25 per cent. of the larvae and pupae collected in June were parasitised by it.

[SILANT'EV (I.).] **Силантьев (И.). Observations on the Life Cycle of** *Cerapteryx graminis* **L.** [*In Russian.*]—*Plant Protection*, vi, no. 5–6, pp. 647–657, 11 figs., 56 refs. Leningrad, 1930.

This account of the bionomics of *Charaeas* (*Cerapteryx*) *graminis*, L., which is an important pest of fodder grass and sometimes also attacks barley, rye and oats, is based partly on the literature and partly on observations carried out in the Leningrad Government and northern Karelia in 1924–27 during a severe outbreak. All stages are described. In the Leningrad Government the adults are usually on the wing in the beginning of July; they sometimes migrate in swarms, covering long distances if the wind is favourable. The female lays about 200 eggs, singly or in small batches, on grass-land, preferably in places covered with moss and coarse growth. The eggs hatch in 2–3 weeks, and the larvae feed on the roots and the lower part of the stems of various grasses, but do not cause severe damage before hibernation, which occurs in large colonies in the moss growing in forests or among bushes on the banks of rivers. In spring they migrate in masses to the meadows and cut through the grass at the base, eating the blades and stems, and leaving hay fields practically devoid of vegetation, with the exception of patches of *Rumex* and clover, which are not attacked. *Phleum pratense* and *Alopecurus pratensis* are also seldom infested. Pupation takes place about 10th June in moss or under the turf.

Owing to various diseases, of which flacherie is the most important, and parasites, outbreaks do not usually last more than 2–3 consecutive years. In 1927 *Ichneumon ligatorius*, Thnb., and *Pimpla arctica*, Zett., emerged from 72 per cent. of the pupae collected in Karelia, and some of the larvae were parasitised by those of an unidentified fly, in one instance the larva of the host harbouring as many as 18 of the parasite. The larvae are also destroyed by ants and by fowls and other birds.

Wild grass-land should be ploughed and sown with clover or varieties of grass that the larvae do not readily attack, such as *Phleum pratense*. As the larvae hibernate near forests or amidst bushes along river banks, it is advisable to let cattle and pigs graze in the adjoining meadows, in order to deprive them of food. The migration of the larvae may be stopped by trenches. Other measures are ploughing at the beginning of July to kill the pupae, burning the stubble and crushing the larvae with rollers. Spraying infested fields with 10 oz. Paris green to 18 gals. water killed 60–100 per cent.

[KRUILOVA (M.) & MEVZOS (N.).] **Крылова (М.) и Мевзос (Н.). Contributions to the Biology of** *Numonia pirivorella* **Mats.** [*In Russian.*]—*Plant Protection*, vi, no. 5–6, pp. 659–662, 7 figs. Leningrad, 1930.

Some of the information given in this paper on *Numonia pirivorella*, Mats., which is an important pest of pears in the Russian Far East, has already been noticed [*R.A.E.*, A, xvii, 586, 587]. Its biology is similar to that of *Nephopteryx rubrizonella*, Rag., recorded from Japan [vi, 403]. It usually has one generation a year, but in some localities a second occurred, the adult moths appearing in September or October. The hibernating larvae feed in the spring on the developing flower buds, then pass to the base of the inflorescences, causing the flowers to wither, and in the second half of May bore into the young fruit. The adults emerge at different dates in July and oviposit on or near the buds. In 1926 the first young larvae appeared about the end of July; each larva injures a single bud, in which it enters hibernation in the first half of August.

The control measures recommended are the collection of the infested inflorescences and fruit; and spraying with lead arsenate or Paris green at the time when the larvae migrate from the buds to the inflorescences, and again when they migrate to the fruit. Arrangements should be made for inspection of imported grafting stock in order to avoid the introduction of the moth into uninfested districts.

[STARK (V. N.).] **Старк (В. Н.). Methods of Investigation of the Insect Fauna of the Forest Soils. i. The Importance of the Soil Strata.** [*In Russian.*]—*Plant Protection*, vi, no. 5–6, pp. 763–772, 2 figs., 1 ref. Leningrad, 1930.

This is a discussion of the relation between the moisture content of different layers of the soil in forests and the insect fauna occurring in them. Laboratory and field experiments, which were carried out in 1928 near Leningrad and are described, indicated that in forests, where the strata of the soil are usually clearly defined, the presence of the different species of insects and their behaviour are closely connected with the physico-chemical, morphological and biological

characteristics of each layer, and probably depend chiefly on the degree of absolute humidity. Different species require a different optimum of moisture, and any variation in it is followed by changes in the behaviour of the insects. As the humidity, aeration and chemical composition of the soil vary in different strata, it is essential that these factors should be taken into consideration when studies of the subterranean insect fauna are being made.

[Yakubyuk (A.).] **Якубюк (А.). On the Modes of exposing Bait Trees.** [*In Russian.*]—*Plant Protection*, vi, no. 5–6, pp. 773–774. Leningrad, 1930.

As trap trees for bark-beetles in forests usually become infested very unequally, the side turned to the ground being attacked and having to be barked first, a new method of exposing them was tried, which proved to be very effective. After removing the branches, the trunks of the trees were cut up into several parts, and these logs were arranged parallel to one another 40 ins. apart and resting on supports, each carrying 10–20. During the period of exposure, the logs were turned once with the lower side upwards. In this way a uniform infestation of all parts of the logs was secured, and they could be barked in a single operation. More than twice as many beetles and larvae were caught by the new method.

[Arkhangel'skiĭ (P.).] **Архангельский (П.). On the Effect of Tobacco.** [*In Russian.*]—*Plant Protection*, vi, no. 5–6, pp. 777–778. Leningrad, 1930.

A brief account is given of experiments carried out in May 1928 in the Kirghiz Republic. In the laboratory all larvae of the apple moth, *Hyponomeuta padellus*, L. (*malinellus*, Zell.), fed on leaves sprayed with tobacco decoction died within 9 days, unless they were about to pupate. Spraying an infested tree with a decoction of 1 lb. of tobacco dust in 3 gals. water did not affect the larvae while they remained in the mines in the leaves, but killed 81·2 per cent. shortly after they came to the surface and began feeding on the sprayed foliage; after a fortnight all had apparently been killed, as no nests were found on the tree.

From these experiments, the author concludes that nicotine acts as a stomach poison as well as a contact insecticide.

Papers noticed by Title only.

Massee (A. M.). **The Control of the Fruit Tree Red Spider** [*Paratetranychus pilosus*, C. & F.] **on Plum.**—*Rep. E. Malling Res. Sta. 1929*, xvii, pt. 1, pp. 85–88, 1 pl., 2 refs. East Malling, Kent, April 1930. Also in *J. Kent Fmrs'. Union*, May 1930, reprint 7 pp. Maidstone, 1930. [*Cf. R.A.E.*, A, xviii, 497.]

Barnes (H. F.). **Control of the Meadow Foxtail Midges** [*Dasyneura alopecuri*, Reut., *Stenodiplosis geniculati*, Reut., and *Contarinia merceri*, Barnes].—*J. Minist. Agric.*, xxxvii, no. 7, pp. 694–697, 1 fig. London, October 1930. [*Cf. R.A.E.*, A, xviii, 501.]

Carimini (M.). **Una varietà di** "*Aspidiotus*," *Aspidiotus hederae* **var.** *unipectinata* **Carimini.** [*A. hederae* var. *unipectinata*, n., on *Acacia dealbata* in Italy.]—*Redia*, xviii, pp. 121–123, 2 figs., 8 refs. Florence, 1930.

China (W. E.). **A new Species of** *Erythroneura* [*E. cassavae*] **(Homoptera, Jassoidea) injurious to Cassava in East Africa** [Tanganyika Territory].—*Bull. Ent. Res.*, xxi, pt. 3, pp. 267–268, 1 fig. London, October 1930.

Tsou (Y. H.). **The Organisation and Work of the Bureau of Entomology of Chekiang Province.** [*In Chinese.*]—*Misc. Pub. Bur. Ent. Chekiang Prov.*, no. 1, 44 pp., 5 pls., 4 charts. [? Kashing] Chekiang, China, 1930.

Cockerell (T. D. A.) & Bueker (E. D.). **Some geophilous Mealy-bugs from Australia (Homoptera : Coccoidea).**—*Amer. Mus. Nov.*, no. 441, 7 pp., 6 figs. New York, 18th December 1930.

Froggatt (W. W.). **Notes on Gall-making Coccids** [in Australia] **with Descriptions of new Species. II.**—*Proc. Linn. Soc. N.S.W.*, lv, pt. 4, pp. 468–474, 2 pls. Sydney, October 1930. [*Cf. R.A.E.*, A, xviii, 40.]

Curran (C. H.). **A new Tachinid** [*Spathimeigenia aurifrons*, sp. n.] **parasitic on a Sawfly** [*Diprion* (*Neodiprion*) sp. in Quebec].—*Canad. Ent.*, lxii, no. 11, pp. 246–247. Orillia, Ont., November 1930.

Marston (A. R.). **Progress in breeding Corn** [Maize] **to resist the European Corn Borer** (*Pyrausta nubilalis* **Hbn.**).—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 51–54. Toronto [? 1930].

Burns (J. W.). **The Rôle of Chemistry in the Control of Insects.** [A brief review of recent work.]—*60th Ann. Rep. Ent. Soc. Ontario 1929*, pp. 57–59. Toronto [? 1930].

Sweetman (H. L.). **The external Morphology of the Mexican Bean Beetle,** *Epilachna corrupta* **Muls. (Coccinellidae, Coleoptera).**—*J. N. Y. Ent. Soc.*, xxxviii, no. 4, pp. 423–453, 7 pls., 19 refs. New York, N.Y., December 1930.

Knowlton (G. F.). **Studies on the Morphology of the Beet Leafhopper,** *Eutettix tenellus* **(Baker)** [particularly the salivary glands and the digestive tract].—*Tech. Bull. Utah Agric. Expt. Sta.*, no. 212, 24 pp., 35 figs., 44 refs. Logan, Utah, July 1929. [Recd. October 1930.]

da Costa Lima (A.). **Supplemento ao 2° catalogo systematico dos insectos que vivem nas plantas do Brasil e ensaio de bibliographia entomologica brasileira.** [Supplement to the second systematic List of the Insects living on Plants in Brazil and a Bibliography of Brazilian Entomological Literature.]—*O Campo*, i, no. 7, pp. 38–48, no. 8, pp. 84–91, no. 9, pp. 28–31. Rio de Janeiro, 1930. [*Cf. R.A.E.*, A, xvi, 416.]

da Costa Lima (A.). **Uma nova praga do algodoeiro no nordeste do Brasil.** [A new Pest of Cotton (*Ferrisia virgata*, Ckll.) in the Northeast of Brazil.]—*O Campo*, i, no. 9, pp. 12–13, 8 figs., 3 refs. Rio de Janeiro, 1930.

da Costa Lima (A.). **Segunda nota sobre especies do genero** *Eucalymnatus* **(Homoptera : Coccidae).** [Second Note on Species of *Eucalymnatus* from Brazil, including *E. scutigerus*, sp. n., from *Moquilea tomentosa*.]—*Mem. Inst. Oswaldo Cruz*, xxiv, fasc. 2, pp. 85–87, 2 pls. Rio de Janeiro, 1930.

Green (E. E.). **Notes on some Coccidae collected by Dr. Julius Melzer, at Sao Paulo, Brazil. (Rhynch.)** [including one new genus and two new species].—*Stettin. ent. Ztg.*, xci, no. 2, pp. 214–219, 3 figs. Stettin, 1930.

[Kryukova (F. A.).] **Крюкова (Ф. А.). On the Method of Estimation of the economic Value of Kitchen-garden Pests.** [*In Russian.*]—*Plant Protection*, vi, no. 5–6, pp. 789–796, 5 figs. Leningrad, 1930.

An account is given of observations carried out in the Leningrad Government in 1928 and 1929 on the effect of infestation by *Phaedon cochleariae*, F., on the development and yield of various cruciferous vegetables. The plants were grown in pots under similar conditions, each being infested with 4, 6 or 10 adult beetles. Radish provêd to be the most susceptible to the attacks of the pest, followed by roots such as turnips, and cabbage, which was the least affected.

[Belanovskiĭ (I.).] **Белановский (И.).** *Rhoptrocerus brevicornis* **Thoms. as Parasite of** *Ips acuminatus* **Gyll.** [*In Russian.*]—*Plant Protection*, vi, no. 5–6, pp. 797–799, 3 figs., 13 refs. Leningrad, 1930.

In March 1928 several larvae of the Pteromalid, *Rhoptrocerus brevicornis*, Thoms., were found near Kiev in a piece of bark that was taken from a pine log and harboured numerous hibernating adults of *Ips acuminatus*, Gyll. In the laboratory the larvae pupated on the 10th April, and the adults emerged at the beginning of May. The fact that the larvae occurred together with the hibernating adults of the host indicates that a hibernating generation of the parasite exists; probably it has not less than two generations a year. The literature on *R. xylophagorum*, Ratz., another parasite of *I. acuminatus*, is briefly reviewed.

[Sokanovskiĭ (B.).] **Сокановский (Б.).** *Dryocoetes alni* **Georg. and** *D. leonhardi* **Egg.** [*In Russian.*]—*Plant Protection*, vi, no. 5–6, pp. 801–802, 3 figs. Leningrad, 1930.

From a study of the morphological characters, particularly the gizzard, which affords the best means of distinguishing the species of the genus *Dryocoetes*, the author concludes that *Dryocoetes leonhardi*, Egg., is a synonym of *D. alni*, Georg. A key to the species, *D. villosus*, F., *D. alni*, *D. hectographus*, Reitt., and *D. autographus*, Ratz., based on this character, is given.

[Borodaevskiĭ (P. P.).] **Бородаевский (П. П.). Biological Observations on the Bark-beetles in the Province of Bryansk.** [*In Russian.*]—*Plant Protection*, vi, no. 5–6, pp. 805–811, 3 figs. Leningrad, 1930.

Observations carried out in different forests in the Bryansk Government in 1928 showed that *Ips* (*Orthotomicus*) *laricis*, F., was abundant in fallen trees, logs and stumps of spruce and pine, the density of the infestation being about 7 individuals to a square foot. The length of the galleries is briefly discussed, and the importance of removing the bark at the correct time as well as the fallen trees and logs is pointed out.

I. duplicatus, Sahlb., together with *I.* (*Pityogenes*) *chalcographus*, L., and sometimes *Polygraphus poligraphus*, L., usually occurred in

association with *I. typographus*, L., on standing or fallen spruce. In one instance, however, *I. duplicatus* was found alone infesting a suppressed spruce about 4 ins. in diameter and 20 ft. high. The galleries started at the top of the roots and reached a level of about 11½ ft., the density of the infestation to 15 sq. ins. varying from about 2 individuals at the base to 19 at the height of 8 ft. Approximately 24 per cent. of the larvae pupate in the thickness of the bark and 76 per cent. in the layer adjoining the sap wood.

P. poligraphus occurred in standing healthy spruces and in fallen trees, in which it infested the branches as well as the trunk, even if the bark was only 1 mm. thick. The density of the infestation of the different parts of spruces of various diameters is discussed; all cut branches and tree tops in an infested stand should be burnt, and single infested trees should be felled and barked.

Though it has been stated that *I. typographus* attacks standing spruce only, whenever the beetles were numerous they invariably infested all the fallen trees as well. A second generation was found on wind fallen spruces in the second half of July. The length of the mother galleries averages 2·5 ins., and about 15 eggs occur to each inch.

[EBERHARDT (G.).] **Эбергардт (Г.).** *Chortophila cilicrura* **Rond., a new Parasite of the Migratory Locust in Daghestan.** [*In Russian.*] —*Plant Protection*, vi, no. 5–6, pp. 813–814. Leningrad, 1930.

In Daghestan in October 1926, egg-pods of the migratory locust [*Locusta migratoria*, L.] were found to contain larvae of *Phorbia* (*Chortophila*) *cilicrura*, Rond., from 8 to 60 occurring in a pod. In some of the pods all the eggs were destroyed, and the pupae of the parasite occurred close by in the soil at a depth of 2–2½ ins. Further examination indicated that the percentage of the parasitised egg-pods varied in different parts of the infested area from 8 to nearly 100. In the laboratory the larval and pupal stages each lasted 10–12 days. Numerous adults were present in the field from the beginning of October, the weather being very warm and sunny, and swarmed in places where the egg-pods were being dug out. The pupae were left to hibernate in an unheated room; those taken to the laboratory continued to give rise to adults throughout the whole winter, but the flies did not live longer than 10–15 days, even if fed on syrup.

P. cilicrura, which is well known as a pest of plants, has not apparently been previously recorded as a parasite.

[LEZHAVA (V.).] **Лежава (В.). Materials for the Study of the Bark-beetles of Georgia.** [*In Russian.*]—15 pp. Leningrad, 1929. Izd. Narod. Kom. Zem. Gruzii, Byuro Bor'bui Vred. Lesa. (Abstract in *Plant Protection*, vi, no. 5–6, p. 863. Leningrad, March 1930.)

A list is given of 25 species of bark-beetles occurring in Georgia, and *Hypothenemus lezhavai*, sp. n., which infested a number of different trees and was especially injurious to mulberry and *Citrus*, is described by G. K. Pyatnitzkii. An instance is recorded of *Pityophthorus pityographus*, Ratz., being found on pear.

Bodo (—). **Ein neuer Schädling in den Ananaskulturen von Wiesen.** [A new Pest of Pine Strawberry Plantations at Wiesen.]—*Mitt. burgenländ. Landwirtschaftskammer*, 1930, no. 6, p. 102. (Abstract in *Neuheiten Geb. PflSchutzes*, 1930, no. 3, p. 81. Vienna, 1930.)

In 1929, the pine strawberry plantations at Wiesen, Austria, were infested by the larvae of a weevil, *Otiorrhynchus* sp., which attacked the roots of the plants and sometimes killed them. They pupate at the end of May, and after 10–14 days the adults emerge. These hide by day and feed on the strawberry leaves by night, ovipositing in July and August. They migrate to uninfested plants, but this may be prevented by barriers of quicklime or potash strewn in strips. They may be collected from traps of moss, leaves and straw.

Fulmek (L.). *Rebelia nudella* **O. in Weingärten.** [*R. nudella* in Vineyards.]—*Das Weinland*, 1930, no. 5, p. 168. (Abstract in *Neuheiten Geb. PflSchutzes*, 1930, no. 3, p. 82. Vienna, 1930.)

The Psychid, *Rebelia nudella*, Ochs., is an occasional pest of vines in the Burgenland district of Austria. Its bionomics are described; parasites obtained from it were the Ichneumonid, *Pezomachus comes*, F., and *Elasmus* sp.

Miles (H. W.). **The Frit Fly Problem in the North West of England.** —*J. R. Lancs. Agric. Soc.*, 1930, reprint 11 pp., 9 figs., 15 refs. Preston, 1930.

Observations of the pests of cereals in Lancashire and Cheshire indicate that the attack of *Oscinella* (*Oscinis*) *frit*, L., on oat crops results each year in severe financial losses. A general life-history is given [*cf.* *R.A.E.*, A, xii, 284, etc.]. In 1928, field observations showed the flies to be increasingly prevalent from about 10th May until the second week in June, attack on the tillers being at its height between 31st May and 19th June in north Lancashire. Examination of the young ears at this period showed a number of larvae feeding at the bases of the young panicles, and a number of bleached and imperfect young flowers were present. The adults of the summer swarm were observed in the fields from 19th to 28th July, and those of the autumn one appeared in north Cheshire from 19th August onwards. The period of maximum prevalence in Lancashire was from 26th August until 10th September, individuals continuing to appear until the first week in October. A comparison of these observations with data from the south of England indicates that the main swarming periods of *O. frit* are later in the north, where the later seasons probably retard the development of both insects and crops. The general types and extent of injury caused by *O. frit* are discussed from the literature. Losses of over 20 per cent. of the tillers were observed in 1929, as much as 35 per cent. of the grain was injured in certain crops, and upwards of 30 per cent. of the ears bore imperfect flowers. Rye grass growing with oats in autumn, when it is sometimes rather slow to become established, may be attacked by *O. frit* in conjunction with *Balioptera tripunctata*, Fall., the larvae of which have been taken in Lancashire feeding in shoots of rye grass and producing injury indistinguishable from that caused by *O. frit*. The relative susceptibility of different

varieties of oats is discussed, those commonly grown in Lancashire being apparently equally susceptible, with an average infestation of about 11·5 per cent. of the grain. In the fells of north Lancashire, although *O. frit* was prevalent, the loss was seen to be less serious on ley oats because the panicle produced was much larger than that produced in oats sown after roots.

Particulars are given of the extent of injury by *O. frit* to a number of samples of oats collected from different localities in Lancashire, the average loss based on these figures being 9·76 per cent. On this basis, and estimating the total yield for 1929 at 60 bushels to the acre to be 4,800,000 bushels, the loss due to the fly was about 470,000 bushels. Details are given of the distribution and periodicity of *O. frit* in north-western England, where the fly appears to have been increasing in severity since 1927, probably owing to the favourable conditions prevailing in the autumn of that year and in the summers of 1928 and 1929. Studies of the date of sowing in relation to attack clearly demonstrate the advantage of early sowing under the conditions prevailing in north-western England. A plot sown on 15th March in Lancashire showed 19·9 per cent. of the grain infested, one sown on 30th March (the normal date) 21·1 per cent., and one sown on 15th April 54·6 per cent. The fortnight's advantage of the earliest sown plot over that sown on the normal date resulted in a reduction of 17 per cent. in the loss of tillers and 18 per cent. in the number of imperfect flowers. Comparative figures obtained in various localities in Lancashire where oats of the same variety were sown on different dates further confirm the value of early sowing, which, however, must be taken in relation to the normal sowing date for the locality concerned. If carried out in February or early March, the practice, common in the north of England, of burning rough herbage and coarse grasses along the hedge and ditch sides should reduce the number of flies emerging from these food-plants.

HUSAIN (M. A.). **Annual Report of the Entomologist to the Government, Punjab, Lyallpur, for the Year 1928-29.**—*Rep. Dept. Agric. Punjab 1928–29*, pt. II, i, pp. 137–170. Lahore, 1930.

An account is given of the pests occurring in the Punjab during the year 1928–29, most of which have already been recorded in previous reports [*cf. R.A.E.*, A, xviii, 27, 462 ; xvii, 413, etc.]. In many cases the results of investigations on the bionomics and control of the more important insects are given in detail.

Damage by *Earias insulana*, Boisd. (spotted bollworm) was believed to be one of the main causes of the failure of the cotton crop in 1928–29, but observations on the intensity of attack in the vicinity of Lyallpur showed that the percentage of infestation in September and October 1928 on native cotton was about 20 and on American cotton never exceeded 25. Moreover, in cotton fields in various localities the highest degree of infestation was 25 per cent. and on American cotton 42 per cent. A total of 2,343 eggs was laid on a single hollyhock (*Althaea rosea*) over a period of 19 days, and the possibility of using this plant as a trap crop is suggested. *Corchorus tridens* is recorded as an alternative food-plant of *E. insulana* in addition to those already noticed [xviii, 27]. During October–November its life-cycle lasted about 3 weeks, but moths from eggs laid during the last week in October did

not emerge for at least 10 weeks. Observations on shed material showed that mature larvae pupated in the fallen buds and bolls, but larvae not fully grown climbed back on to the cotton plant.

Owing to the increasing prevalence of Aleurodids on cotton during the last few years, investigations on their bionomics and control have been undertaken. The eggs are almost invariably laid on the lower surface of the leaves. A single female may lay as many as 53 in captivity. From August to November the life-cycle lasted 18–36 days, of which the egg stage occupied about 4–5 days and the pupal stage 2–6, but during the winter months, although development continues, the various stages are protracted and the life-cycle requires about 90 days from November to February. In the early stages the whiteflies, even when present in very large numbers, do not produce any external signs of injury to the plant, but when honey dew is secreted and fungous growth appears on it, a severely attacked crop may remain stunted and produce poor fruit. On the whole the damage does not appear to be serious. Attempts to transmit mosaic disease by means of Aleurodids fed on infected cotton plants gave negative results. During 1928 this insect was serious in four districts but of minor importance in the other cotton-growing areas. Although *Heliothis obsoleta*, F., is a serious pest of cotton and maize in the United States, it practically refuses to feed on these plants in India.

Damage to the ears of rice by *Schoenobius bipunctifer*, Wlk., varied from 2·8 to 12·5 per cent. in early-sown crops and from 68·4 to 87·5 per cent. in late-sown crops. *Dialeurodes citri*, R. & H., on *Citrus* was effectively controlled by spraying with rape oil soap. An unidentified weevil was reported to be causing serious and increasing damage to walnuts in one locality. The eggs are laid singly in holes in young walnuts at the beginning of May. The grubs bore into the fruit, which falls to the ground. It is estimated that 50 per cent. of the fruit has fallen by the middle of June and that finally more than 75 per cent. of the crop is lost. There seems to be one generation a year. *Eriosoma lanigerum*, Hausm., appears to have become established in all the apple orchards of the Simla Hills and the Kulu Valley. The Aphids migrate from the shoots to the roots about the end of November, only a few hibernating in the crevices of the bark, and leave the roots again about the middle of March. The Trypetid attacking melons at Jullundher has been identified as *Carpomyia vesuviana*, Costa. This fruit-fly destroys 57 per cent. of the early crop, but only 5·3 per cent. of the late crop. Pupation usually takes place in the first inch of soil, and the larvae never penetrate deeper than 3 ins. Paris green dust used at the rate of 1 : 4 against termites on sugar-cane seriously affected the germination of the setts [xviii, 29], but at the rate of 1 : 9 or 1 : 12 it greatly reduced the infestation without causing injury to the plants. *Brithys crini*, F. (*Glottula dominica*, Cram.) was common in November and caused much damage to ornamental lilies.

BALACHOWSKY (A.). **Contribution à l'étude des coccides de l'Afrique mineure. 8. Chalcidiens parasites de coccides recueillis en Tunisie par M. le Professeur P. Marchal.**—*Bull. Soc. Hist. nat. Afr. N.*, xxi, pp. 115–116. Algiers, 1930.

The following parasites of Coccids were collected in Tunisia in 1910: the Aphelinids, *Aphelinus* (*Aphytis*) *longiclavae*, Mercet, from *Aspidiotus hederae*, Vallot, and *Pteroptrix dimidiatus*, Westw., from *Filippia*

oleae, Costa; the Encyrtids, *Gyranusa matritensis*, Mercet, and *Encyrtus masii*, Silv., from *F. oleae*, *Aphycus* (*Euaphycus*) *flavus*, How., from *Saissetia oleae*, Bern., *Paraphaenodiscus bicolor*, Mercet, from *Micrococcus similis*, Silv., and *Chiloneurinus* (*Chiloneurus*) *microphagus*, Mayr, and *Habrolepis zetterstedti*, Westw., from *Lepidosaphes ulmi*, L.; and the Pteromalid, *Scutellista cyanea*, Motsch., from *Ceroplastes rusci*, L.

KADEN (O.). **Relatório anual de 1929. Secção de Fitopatologia.** [Report for 1929 of the Section for Phytopathology.]—8vo, 56 pp. S. Thomé, Direcção Serviços Agric., 1930.

In 1929, the year of the establishment of the phytopathological department of S. Thomé and Principe, a survey was made of the chief diseases and pests of cultivated plants occurring in these islands.

The first section of the report deals with S. Thomé. Investigations on the cacao thrips, *Selenothrips* (*Heliothrips*) *rubrocinctus*, Giard, showed that it is favoured by lack of constant atmospheric moisture. The measures advised are more extensive use of wind-breaks, planting of trees to ensure constant moisture and rain, heavier shade for plantations exposed to the morning sun, climbing plants for covering rocky ground, and proper manuring, etc., of the cacao. High shade trees should be retained until the conditions for cacao are improved. Spraying is limited to special cases, such as the prevention of the development of habitual centres of infestation. The only sprays found of any value were lime or clay (4 per cent. kaolin) in suspension and Bordeaux mixture. Native natural enemies, which include a few predators and a fungus, are rare. The introduction of a Eulophid, *Dasyscapus* sp., which attacks this thrips in the Gold Coast, is being considered.

Other pests of cacao and Coccids attacking coffee have already been recorded [*R.A.E.*, A, vi, 384, viii, 491–493]. Of the latter, *Coccus* (*Lecanium*) *viridis*, Green, *Pseudococcus citri*, Risso, and *Orthezia insignis*, Dougl., are of economic importance. *C. viridis* is largely checked by a fungus, *Cephalosporium lecanii*, which develops rapidly in the rainy season. The Scolytid, *Stephanoderes hampei*, Ferr., is a serious pest of coffee berries at between 1,000 and 2,000 ft. and occurs at higher altitudes. Cultural measures are difficult because harvesting in S. Thomé occurs throughout the year, but the introduction of the parasite, *Prorops nasuta*, Wtrst., from Uganda might be of value. The berries are also attacked by a Pyralid, *Thliptoceras* sp., which does considerable harm in low-lying plantations in the north of the island, and also mines in the twigs. The Anthribid, *Phloeobius hypoxanthus*, Jordan, which develops in 10–12 weeks, kills thousands of bushes of *Coffea arabica* during the dry season, the larvae boring into the stems and branches, but *C. liberica* is seldom attacked. Coconuts and oil-palm (*Elaeis guineënsis*) suffer some damage from *Oryctes latecavatus*, Fairm., and are infested by *Aspidiotus palmae*, Morgan & Ckll., and *Pseudaonidia trilobitiformis*, Green, which cause little harm.

On the island of Principe, *Erythrina indica*, a shade tree for cacao, is severely attacked by Coccids, and it should be replaced by other species, such as *E. umbrosa*, that resist infestation. To combat *S. hampei*, which causes great losses, a series of recommendations, designed to remove all opportunities for breeding, are made, based

on the fact that the whole coffee crop is harvested between October and April. The measures include the removal of all infested berries, thorough weeding, and prompt shipping of all coffee beans, so as to avoid having any in storage during this period. The pulp that has been removed should not be thrown on manure heaps, but should be mixed with lime in separate heaps, and all sacks and implements should be fumigated with carbon bisulphide. The extermination of this beetle may be expected if the work is done carefully.

Regnier (—) & Lespes (—). **Sur l'existence d'une génération estivale chez le criquet pèlerin** (*Schistocerca gregaria* **Forsk.**).—*C.R. Acad. Sci. Fr.*, cxci, no. 22, pp. 1082–1083. Paris, 1930.

In experiments in Morocco, eggs of *Schistocerca gregaria*, Forsk., ph. *gregaria* that were just beginning to hatch were placed in cages on 5th May. The hatching terminated on 14th May, and the adult stage was reached between 15th July and 1st August. The change of colour, from pink to yellow in the case of males and to greyish-yellow in that of females, took place on 5th–6th August, and oviposition commenced on 17th August. The hatching of hoppers began on 30th August ; one third of them presented the characteristics of the transitory phase.

The authors conclude from their observations that a summer generation occurs in the annual cycle of *S. gregaria* in North Africa.

Normand (D.). **La piqûre des bois coloniaux.**—*Rev. Bot. appl.*, x, no. 108–109, pp. 680–682, 3 refs. Paris, 1930.

Five species of trees from Kamerun are added to the list of those the timber of which is attacked by *Lyctus brunneus*, Steph., that was given in a paper already noticed [*R.A.E.*, A, x, 574]. The author holds the opinion that any process that hastens the seasoning of the wood will reduce the chances of attack by this beetle. For wood already attacked, fumigation with paradichlorobenzene at the rate of approximately 2 oz. to 35 cu. ft. [*cf.* xvii, 285] is suggested.

Dagron (M.). **Les borers du caféier au Togo.**—*Rev. Bot. appl.*, x, no. 108–109, pp. 720–723, 1 fig. Paris, 1930.

Since 1924, coffee cultivation in French Togoland has developed rapidly, but production is already seriously menaced by the attacks of numerous pests, of which the most important are the Lamiid, *Bixadus* (*Monohammus*) *sierricola*, White, the larvae of which make galleries in the stem, and the Bostrychid, *Apate monacha*, F., which is less prevalent. These borers appear only to attack weak trees. The plantations are situated on any ground near the villages, and the bushes are planted close together, without shade, and are not cultivated. The soil is light and very shallow, overlying a hard pan, and this probably explains the weak state of the bushes during the third and fourth year. To combat the borers more suitable situations have been chosen, crowded plantations have been thinned, dead or badly infested plants have been destroyed, and slightly infested ones have been treated with a mixture of one part carbolineum to two parts petrol. This mixture, which has given good results for two years, is introduced by means of a small copper syringe into one of the

galleries made by the borer, and the holes are stopped up with a little wet earth. In this way the eggs and larvae throughout the bushes are destroyed.

Wahl (R. O.). **The Maize Stalk-borer.**—*Fmg. S. Afr.*, reprint no. 53, 4 pp. Pretoria, August 1930.

In the spring, adults of the maize stalk-borer [*Busseola fusca*, Fuller] prefer to oviposit on the larger maize plants, whereas the moths of the second generation choose the youngest plants of maize or *Sorghum* available, a fact that explains why late-planted maize so frequently fails. The system of autumn trap-crops is based on this preference and consists in providing the moths of the second and third generations with young plants of maize or *Sorghum* in strips of about 10 rows each interplanted with the main maize crop at intervals of about 250 yards, or in the form of small plots scattered among the maize fields. The trap-crop should be planted so that it is 6–12 ins. high when the second brood of caterpillars appears. In winter, if stubble that shelters the larvae lies flat on the surface of the soil, over 95 per cent. are killed by the cold on the eastern high veldt, exposure for a few nights to 20° F. being fatal. Thus if the stubble of trap-crops containing overwintering caterpillars is exposed above the soil by the end of June, the caterpillars will be dead by the middle of August, and the stubble may then be ploughed in. Tests on the eastern high veldt indicate that the caterpillars may descend to the " roots " of the stalks considerably earlier than was thought to be the case, and in the autumn of 1930 it was found that by 9th April and before the first frost a larva was below ground level in 96 per cent. of the stalks. In areas where the soil retains moisture well enough to rot the stalks and where the cold is not sufficiently severe to kill the caterpillars, cattle should be concentrated on the late-planted fields (if these are not cut for silage), and, as soon as the best of the feeding has been consumed, the field should be ploughed deeply enough to turn the sods over completely. To be effective this ploughing should be done in May or June. As living caterpillars have been found in most of the weeds growing in maize fields during June, it is important that the weeds should be buried deeply as soon as possible.

With regard to control in summer, larvae should be prevented from migrating to plants in the vicinity of those on which they hatch by top-dressing [see next paper] or by cutting out the infested plant. The plants should be cut off below the line of infestation and, provided that this line is above the growing point of the plant, only a slight retardation in growth will ensue. This treatment should be applied three or four times between the middle of November and the end of the year. In a plot where infested plants were cut out every week during this period the yield was more than half as much again as that from an adjoining untreated plot.

Ripley (L. B.) & Hepburn (G. A.). **A new Insecticide against Maize Stalk-borer.**—*Fmg. S. Afr.*, reprint no. 67, 7 pp. Pretoria, September 1930.

In further experiments on top-dressing for the control of the maize stalk-borer [*Busseola fusca*, Fuller], kymac and pulvex [two prepara-

tions containing derris] and cryolite were used, at the rates previously recommended [*R.A.E.*, A, xviii, 160], on maize in which 75 per cent. of the stalks were attacked. In spite of the fact that owing to continued rains the work was done nearly a week late, the increase in weight of grain from plants treated with kymac was 27 per cent., with cryolite 26 per cent., and with pulvex 13 per cent. (a low figure for which its inferior penetration powers are probably responsible), the total cost being only 1*s*. 6*d*. per acre.

Further experiments have resulted in the production of a derris insecticide, derrisol, which is more satisfactory than kymac, pulvex or cryolite in that it is more toxic in relation to its cost, it has no injurious effect on the plants even when used at excessive strengths, no agitation is required during application, its powers of penetration and of adhesion to the plant are superior, and, being more highly concentrated, it costs less to transport and is more conveniently handled. This liquid was especially made for top-dressing maize against *B. fusca* and should not be confused with the derrisol previously employed [xv, 334], which was injurious to the plant. Cryolite being non-volatile remains in the plant until washed out by rain, but derrisol, although resisting rain better than cryolite, slowly volatilises in a hot sun. Soap added to cryolite suspension at the rate of 1 lb. to 20 gals. increases its penetrating powers and its toxicity. Experiments carried out in an effort to make the insecticide remain active on the plant for a longer period in order to kill borers hatching after treatment were unsuccessful, but the addition to the derrisol liquid of a non-volatile stomach poison in the form of a suspended powder, together with an adhesive to prevent its being washed out by the rain, appears to be promising. Synthetic cryolite appears to be the most satisfactory stomach poison, and size and gelatinised starch seem to be the most promising of the adhesives tested. Experiments are also being made in order to find a powerful and cheap deterrent that may be added to the derrisol to prevent the moths from ovipositing in the treated fields, and to produce an apparatus that will squirt the insecticide into the maize leaf funnel with a certain amount of pressure. When a field becomes generally infested, derrisol, diluted with water (1 : 1,000) on the day it is used, should be applied at the rate of one dessert-spoon to each plant. One gallon of derrisol is sufficient to treat about 45 acres, the cost being about 9*d*. per acre for the insecticide and the total cost about 1*s*. 6*d*. After derrisol is thoroughly dried on the plants, heavy mists or light rains will probably not wash it off, as it adheres well and is insoluble in water.

JACK (R. W.). **The Army Worm** (*Laphygma exempta*, **Wlk.**).—*Rhodesia Agric. J.*, xxvii, nos. 9 & 10, pp. 912–924 & 1052–1064, 1 pl. Also as *Bull. Minist. Agric. & Lds.* [*Rhodesia*], no. 796, 27 pp., 1 pl. Salisbury, Rhodesia, 1930.

In January 1930, practically the whole maize-growing area of Rhodesia was invaded by the army worm, *Laphygma exempta*, Wlk. The life-history of the moth is outlined [*cf. R.A.E.*, A, xvii, 350], and the stages described. A study of the seven outbreaks that have occurred in the Colony during the past 20 years indicates a compara-

tively short oviposition period commencing more or less simultaneously in all parts. The favourite food-plants are all graminaceous, several wild grasses being severely attacked; the chief damage has been on maize, perhaps simply because this is the most extensively cultivated crop. Eggs are not freely laid on well-grown maize, though they may be laid on young plants or suckers, and most of the severe attacks on maize have been traceable to a recently grown crop of grass on the land or to invasion from outside.

Natural enemies of the larvae include various birds and predacious insects. A common Tachinid parasite, probably *Sturmia atropivora*, R.-D., sometimes attacks a high percentage of the caterpillars, the young larva feeding within the body of the host until it is nearly full-grown. Pupation occurs within the host or in the soil near by. An Ichneumonid, thought to be *Henicospilus antancarus*, Morl., is of somewhat less value; the host caterpillar generally pupates before the adult parasite emerges. An unidentified Chalcid is an external parasite of the caterpillar. Its life-cycle requires only about a fortnight, so that two generations might occur during an outbreak of the army worm, and one female may deposit as many as 35 eggs, but the numbers of the parasite do not increase sufficiently until the bulk of the damage has been done. The most efficient factor in reducing outbreaks of the caterpillars is disease, especially wilt disease, while conditions are favourable for it, but diseases are so dependent upon atmospheric conditions that it is not possible to accelerate or disseminate them artificially. A striking feature of the incidence of *L. exempta* is the rapid oscillation between great abundance and practical or complete absence; the moths probably cover great distances by flight [xvi, 334].

The importance of keeping watch for incipient infestations cannot be over-estimated. Undoubtedly most of the attacks come from grasses, particularly ripoko grass (*Eleusine indica*), but clean cultivation is not a complete safeguard. Teff grass (*Eragrostis abyssinica*) might be useful as a trap crop, if it proved definitely more attractive for oviposition than other grasses. Sprays for maize plants have not been very satisfactory. They are very susceptible to arsenical poisoning; only lead arsenate can be applied with safety, and its action is very slow, in addition to which it seems to act as a repellent so that a uniform covering of all the leaves is necessary, and this is difficult to obtain. Power sprays are required to cover any considerable acreage of maize, and these are only available in very few cases. Contact sprays other than those containing soluble arsenic have been tried with poor results. One of the best methods of destruction practised is shaking the caterpillars off the plants and crushing them either with the feet or with planks. The use of harrows, brush drags, etc., was not very beneficial and tended to injure the crops. Many caterpillars were destroyed in one district by using maize leaves and coarse grass dipped in a 0·5 per cent. sodium arsenite solution as baits [xvi, 334]. The bait was only effective while it was moist. The grass between rows of maize, which often harbours practically all the caterpillars at certain times, may be thoroughly drenched with sodium arsenite solution, great care being taken not to touch the maize plants with the poison; a watering can is probably the best implement for the purpose. Cattle dip (a sodium arsenite solution with a certain quantity of tar products and soap added) is a very good contact poison to use on waste lands to destroy the

caterpillars before they migrate to maize; it is best used in conjunction with defensive trenches and furrows, the construction of which is described.

PETTEY (F. W.). **New Methods for the Control of Codling Moth. Experiments carried out during 1930.**—*Bull. Dept. Agric. S. Afr.*, no. 90, 10 pp., 1 fig. Pretoria, 1930.

In the western districts of Cape Province, the control of the codling moth [*Cydia pomonella*, L.] is more difficult at the present time than it was 20 years ago, owing chiefly to the larger trees and the more extensive orchards. In cases of severe infestations on apples and in seasons of light pear crops, lead arsenate at the rate of 1¼ lb. in 40 gals. water applied fortnightly throughout the season is not satisfactory. More effective results are obtained by doubling the amount of arsenate and adding ¼ lb. calcium caseinate spreader, but the removal of spray residue is rendered more difficult. A programme of about 7 sprays, each consisting of 1¼ lb. lead arsenate in 40 gals. water, with 1 per cent. medium summer oil added to two of the first brood and one of the second brood sprays, the oil-arsenate sprays being applied when the maximum number of the eggs of the two broods are about to hatch, will give considerably higher control than the usual arsenate programme and will be somewhat cheaper than the double strength arsenate programme with the oil omitted. This programme will control mites and young scale-insects and allow the omission of the usual winter spray in orchards where the latter are not a major pest, unless a winter spray is required against fungous diseases. The addition of nicotine sulphate (1 : 1,200) to any of the oil-arsenate cover sprays will control woolly aphis [*Eriosoma lanigerum*, Hausm.] if the sprays are thoroughly applied. Programmes in which summer oil and summer oil with nicotine sulphate are added to or substituted for varying numbers of lead arsenate sprays are discussed in detail. It is concluded that summer oil sprays with lead arsenate are only justified under conditions of severe infestation, unless tests over a number of years show that a programme containing 3 sprays of 1 per cent. medium oil will allow the omission of the usual winter spray and will not injure the trees or fruit. When desirable for controlling other pests on pears or apples, 1 per cent. medium oil and nicotine sulphate (1 : 800 or 1 : 1,200) may be used with advantage as a substitute for one or two of the lead arsenate sprays; more than two applications are not recommended on account of expense. Summer oil sprays must be thoroughly applied if all eggs present are to be covered.

An artificial cryolite from Germany, used at the rate of 2 lb. with ¼ pt. fish oil in 40 gals. water, and applied at intervals of three weeks throughout the season, gave more satisfactory results than a similar normal programme of lead arsenate alone, and appeared, moreover, to reduce considerably infestations of mealybugs [*Pseudococcus maritimus*, Ehrh.] on pears [*cf.* *R.A.E.*, A, xviii, 660]. A cryolite from New York scorched the foliage severely.

The great importance of timing spray applications correctly is pointed out. The use of bait pans for this purpose is discussed, and a bait consisting of 7–10 per cent. solution of crude treacle with or without yeast is recommended. Neglect of supplementary measures,

such as thinning the fruit, scraping and banding the trees and destroying infested fruit, is responsible, more than any other factor, for the failure of growers to control *C. pomonella*.

Locust Control.—Med. 8vo, vii+86 pp., 1 pl., 12 figs. Allahabad, Govt. Press Utd. Prov., 1930.

The first part of this paper, "Brief Instructions issued by the Local Government," gives a summary of the main points of the life-history and habits of *Schistocerca gregaria*, Forsk., and measures for its control in the United Provinces, which are dealt with in detail in the memorandum by P. B. Richards, which constitutes the second part of the paper.

Locust invasions of India are apparently caused by the migration of swarms bred in Arabia and Persia that originated in North Africa. In the United Provinces the eggs hatch in 12–40 days, and the nymphal stage lasts at least 30. Adults live from 4 to 7 months.

Adult swarms that are still feeding should be dealt with by crushing, burning, etc., in the early morning when they are sluggish, or by scattering a poison bait consisting of bran and sodium arsenite with the addition of salt or some other attractive substance during the evening. For pairing swarms, which do not always feed, the use of baits is not recommended. In the case of egg-laying swarms, the crushed bodies of the females should be left in the egg-holes, as this will largely prevent the development of any eggs that may have been laid.

All breeding grounds should be surrounded by a barrier consisting of a trench, fence or water course to keep the young hoppers within a circumscribed area, so that the damage they can cause is limited and measures for their destruction are facilitated. If it is impossible to surround a breeding ground completely, as much as possible should be enclosed in large blocks. Where soil conditions permit, a continuous trench should be dug, 1½ ft. deep and at least 1 ft. wide, to prevent first and second stage hoppers from jumping across. The walls should be vertical, or if the soil permits, wider apart at the bottom than at the top. In most soils in the United Provinces the trench wall even when smoothed allows sufficient footing for very small hoppers to climb out; in these cases a 3-inch strip of oilcloth should be nailed along the top of the trench on the outer edge, or if sufficient oilcloth is available, on the inner side as well to prevent hoppers caught in the trench from climbing back into the breeding ground. Trap pits two feet deeper than the bottom of the trench and at least four feet square should be dug at intervals, flush with the outer wall of the trench, preferably not more than 100 yards apart. If possible, oilcloth strips should be used round the tops of the pits. The amount of food available within the trenched areas should be as small as possible so that the hoppers die of starvation, for if there is sufficient nourishment to allow them to reach the third stage, they are strong enough to jump the foot-wide barrier. For this reason weeds, jungle grass, bushes, etc., should be removed as far as possible by cutting or burning, and crops within the area should be isolated by cross trenches or cut and removed for fodder. The construction and lay-out of the trenches and their cost are discussed in detail.

Where it is not possible to dig ring trenches, the breeding ground should be surrounded by a fence of metal sheeting with a smooth, slippery surface. Trap pits should be dug at intervals, or, where this is impossible, metal sheeting should be arranged in the form of

a box above ground in contact with the barrier, with ramps of earth raised as high as the edges of the trap to allow the hoppers to enter. Details for the erection of the fences and traps are given.

Flooding of breeding grounds should be carried out wherever sufficient water is available. Complete submersion of breeding grounds for 24 hours at a late stage in the development of the embryos has been proved to kill every egg. Protracted flooding of recently laid eggs is reported to have been equally successful. It has also been reported that much lighter waterings have prevented the emergence of the young hoppers, which were unable to break through the surface crust when the soil dried. Very young hoppers collect in small compact bands and usually remain for some time on the breeding ground; moreover, they readily take shelter from the hot sun and at night in dry herbage. Where circumstances permit, providing quantities of dry rubbish and setting fire to it when it is placed over the hoppers or when they are resting in it, affords a simple method of destruction.

Bands of hoppers may be driven by labourers (each provided with a white cloth to stretch between himself and his neighbour) towards long steep-sided trench traps, dug some distance in front of the band and preferably reinforced with oilcloth strips. To prevent the bands turning aside on reaching the trench, vertical barriers of smooth metal, or cloth screens with a 6-inch strip of oilcloth attached near the upper edge should be erected obliquely from each end of the trap trench.

The necessity for digging trenches may sometimes be obviated by driving the bands into ponds, etc., the surface of which has been coated with oil. The bands should not be hustled or the hoppers become tired and stop; neither should movement across the front of a moving band be permitted. Details are given regarding the construction of pits and the making, erection and care of screens. In grass jungle or forest the hoppers should be destroyed by burning or by sodium fluosilicate, used as a bait in stony or forest areas or as a dust in jungle grass or heavy undergrowth. In the latter case it should be mixed with 4 times its weight of finely powdered slaked lime and applied at the rate of 5 lb. per acre when the leaves are moist. The preparation of the sodium fluosilicate bait, the cost of ring-trenching, and the use of oils for the destruction of locusts in trenches and pits are discussed in three short appendices.

In the third part of the paper, D. B. Emerson deals with the utilisation of water supplies for locust control in irrigated areas. Flooding the breeding grounds when the eggs are hatching kills large numbers of hoppers. Instead of using oilcloth bands, trenches round breeding grounds may be flushed with water, and the half-dead hoppers swept into sumps. In some cases a ring of water with dry roads across it leading into traps is as effective and cheaper than trenching round breeding grounds. The movement of wandering swarms of hoppers could be restricted by utilising selected channels, etc., to replace or supplement other barriers. By studying the maps of water channels, it would be possible to foresee the points at which swarms might be expected to congregate and so have traps prepared to destroy them. Numerous experiments in the construction of land and water traps suitable for use in conjunction with water course barriers are described in detail. The driving of hoppers into water channels, except in conjunction with water traps, should be discouraged, as the rate of mortality effected is at present too uncertain.

Hutson (J. C.) & Park (M.). **Investigation of the Bunchy Top Disease of Plantains in Ceylon.**—*Trop. Agriculturist*, lxxv, no. 3, pp. 127–140, 3 pls., 4 refs. Peradeniya, September 1930.

An account is given of experiments to determine whether bunchy top of bananas in Ceylon could be transmitted from diseased to healthy plants by *Pentalonia nigronervosa*, Coq. (banana aphis) under controlled conditions in which special endeavours were made to eliminate the complications arising from the presence of root parasites, particularly *Rhizoctonia bataticola* and Nematodes. The results demonstrated conclusively that the disease is transmitted by *P. nigronervosa* [*cf. R.A.E.*, A, xvi, 66] and that root disease is not necessarily a factor in its causation. A subsidiary experiment indicated that apparent differences of susceptibility may be associated with variations in the length of the period between infection and the appearance of symptoms in plants of different varieties. Methods of control are discussed, and it is suggested that under Ceylon conditions the most satisfactory is the periodical examination of plants and the complete destruction of whole stools in which symptoms of the disease occur.

Jepson (F. P.). **Termites attacking** *Hevea brasiliensis* **in Ceylon.**—*Trop. Agriculturist*, lxxv, no. 3, pp. 143–156, 5 pls., 2 refs. Peradeniya, September 1930.

After giving brief notes on the habits of termites in general, the author discusses in detail the records of *Calotermes* (*Neotermes*) *greeni*, Desn., *C.* (*Glyptotermes*) *ceylonicus*, Holmgr., *C.* (*G.*) *dilatatus*, Bugnion & Popoff, and *Coptotermes ceylonicus*, Holmgr., attacking rubber (*Hevea brasiliensis*) in Ceylon; these have already been noticed from an unsigned report by him, which was erroneously attributed to J. C. Hutson [*R.A.E.*, A, xviii, 558]. A list is given of the localities in Ceylon from which these four species of termites have been authentically recorded. Although the other known local species of *Coptotermes*, *C. exiguus*, has not been found in *Hevea*, its habits are similar to those of *C. ceylonicus*, from which it is not easily distinguished. *Calotermes* (*Neotermes*) *militaris*, Desn., which is a serious pest of tea, has not been taken in rubber, but has been recorded from tea and dadap [*Erythrina*] on certain estates or in districts where rubber is grown. The methods of control suggested are similar to those recommended for the treatment of infested tea bushes [xviii, 105, etc.].

Thomas (P. H.), Raphael (T. D.) & Turner (H. A.). **Codlin Moth Control. Experiments in Tasmania.**—*Fruit Wld. Austr.*, xxxi, no. 9, pp. 342–343. Melbourne, 1st September 1930.

Experiments were carried out in 1929–30 in Tasmania to determine the efficiency of summer oils in the control of *Cydia* (*Carpocapsa*) *pomonella*, L. Four sprayings were found necessary in the south and three in the north, applications being made at fortnightly intervals beginning at the calyx stage. A certain amount of control was obtained with the oil sprays alone, applied at a strength of 1–50, and applications of one spray of 1 lb. lead arsenate powder to 50 gals. followed by summer oils were more successful, being sometimes more effective than lead arsenate alone. With a combination of summer oil (1–80)

and lead arsenate (1 lb. to 50 gals.), practically complete control was obtained, the oil serving to spread the lead arsenate lightly and uniformly over the leaves and fruit and maintaining a protective covering. Against red spider [*Bryobia praetiosa*, Koch], summer oil at strengths of from 1–50 to 1–80 killed only the younger mites. No injury to fruit or foliage was caused by the use of the oil, but an early leaf fall occurred where lead arsenate was used at the rate of 1 lb. to 25 gals. *C. pomonella* was rather more abundant than usual in 1929–30, when the largest number of affected apples was found towards the end of February and early in March. The fruit at this period was mainly attacked at the side, the larvae in the earlier part of the season having entered at the calyx.

PESCOTT (R. T. M.). **Codling Moth Control. Report on 1929–30 Experiments at Harcourt.**—*J. Dept. Agric. Victoria*, xxviii, pt. 8, pp. 486–490, 1 graph. Melbourne, August 1930.

The object of these experiments, undertaken in Victoria during 1929–30, was to determine a spray programme that would be more successful in controlling *Cydia pomonella*, L., on apples than those already in use and would at the same time prove economical [*cf. R.A.E.*, A, xviii, 259]. The results, which confirmed those obtained in previous years, showed that spraying with lead arsenate alone is unsatisfactory, but that calyx sprays of lead arsenate followed by applications of white oil give good control. The following programme is recommended: Two calyx sprays of lead arsenate (5 lb. paste and ½ lb. casein spreader to 80 gals. water) applied with an interval of 10 days, followed by three or four sprays of a white oil emulsion (1 in 40) at intervals of approximately a month. The number of oil sprays is dependent on weather conditions, and the time of their application should be accurately determined by the use of bait traps in the orchard.

HOFFMANN (W. E.). **The Wood of Water Pine Roots as a Substitute for Balsa Wood for entomological Uses.**—*Lingnan Sci. J.*, ix, no. 1–2, pp. 138–139. Canton, June 1930.

The wood of the root of the water pine (*Glyptostrobus heterophylla*), which is a commercial product in China, has been found a satisfactory substitute for sheet cork for lining the bottom of insect boxes or cases.

HOFFMANN (W. E.). **The Food Habits of *Erthesina fullo* (Thunb.).**—*Lingnan Sci. J.*, ix, no. 1–2, pp. 139–142, 1 fig. Canton, June 1930.

In China, many Pentatomids and Coreids feed on the trunks or large branches of a great variety of trees. One of the common Pentatomids, *Erthesina fullo*, Thnb., occurs on 31 different species, a list of which is given, including several fruit trees. The adult feeds from within a few inches of the ground to a height of 7 or more feet and occasionally on the large branches, the mouth-parts being pushed

straight into the tree. The eggs are deposited in small masses on the leaves. In the first instar, the nymphs remain close to the egg-mass and do not feed ; later they attack the branches close to the place of hatching. The winter is passed in the adult stage, sometimes in buildings. There are several generations a year.

Aldaba (V. C.). **The Coconut Leaf-miner Infestation of Laguna, Batangas, and Tayabas.**—*Philipp. J. Agric.*, i, no. 2, pp. 145–164, 1 graph, 1 fldg. map. Manila, 1930.

Promecotheca cumingi, Baly (coconut leaf-miner) is always present in coconut groves in the Philippines, but usually only a few leaflets on isolated trees are attacked [*cf. R.A.E.*, A, i, 118, 311]. During recent years, however, a severe outbreak occurred, and the beetle spread in all directions from S. Pablo, where trees were known to have been attacked at the beginning of 1928, until at the end of January 1930 about 7,000,000 trees were infested. The trees most seriously injured are those round dwellings, along roadsides, on the banks of rivers and streams, on the borders of lakes and rice fields, on hillsides, and in isolated groves. The possible factors that may have produced the outbreak are tentatively discussed. Two unidentified parasites of the egg and four of the larva have been recorded. The life-cycle of the egg parasites lasts about 23 days, and as many as five have been obtained from one host egg. As many as 35 individuals of one of the other species have been obtained from one host larva.

As the beetle does not fly long distances, it is suggested that a band of trees round the entire circumference of the infestation should be sprayed with calcium arsenate and soap as an adhesive, to prevent the further spread of the pest. The individuals within this area could then be systematically destroyed by collecting the adults and larvae, by spraying them with ordinary soap as a contact poison, by burning heavily infested leaves, and by transporting parasites from areas where they are abundant to localities where they are scarce [*cf.* xviii, 652].

Bondar (G.). **Hispineos minadores das folhas dos feijões.** [Hispid Miners of the Leaves of Beans.]—*Correio agric.*, vii, no. 7, pp. 179–182, 4 figs. Bahia, July 1930.

The larvae of several species of Hispids mine the leaves of beans in Brazil, and the leaves are also eaten by the adults. *Anoplitis canavaliae*, Mlk., is the most injurious in Bahia, attacking *Canavalia ensiformis*, *Cajanus indicus*, *Phaseolus vulgaris*, *P. lunatus* (lima bean), *Dolichos lablab*, and various wild Leguminosae. The egg, larva and adult are briefly described. The eggs are laid in pairs on the lower leaf-surface, and the resulting larvae usually mine together. The surface above the larval mine is greyish owing to the accumulated excreta and the destruction of the chlorophyll. *Chalepus* (*Xenochalepus*) *ancora*, Chap., lays its eggs singly on the lower leaf-surface. Its food-plants include *Canavalia* and, rarely, *Phaseolus*. *Octotoma tessellata*, Mlk., infests climbing Leguminosae of the genera *Canavalia* and *Cymbosema*.

Frost (S. W.). **The Leaf-miners of *Aquilegia*, with a Description of a new Species.**—*Ann. Ent. Soc. Amer.*, xxiii, no. 3, pp. 457–460, 1 pl. Columbus, Ohio, September 1930.

Phytomyza minuscula, Gour., which makes linear mines in the leaves of *Aquilegia*, is widespread in North America, but *P. aquilegiae*, Hardy, which causes blotch mines, does not appear to occur there, records of it [*cf. R.A.E.*, A, iii, 709; iv, 450; v, 220, 404, 405; ix, 434] having been due to its confusion with *P. minuscula*. *P. aquilegiana*, sp. n., which causes blotch mines of a different type, is described from *Aquilegia* in Pennsylvania and New York. *P. plumiseta*, Frost, was described from *Aquilegia* and *Thalictrum* [xiii, 571], but does not attack the former plant, the record having been due to its confusion with *P. aquilegiana*.

Sellers (W. F.). **The Identity of *Zenillia blanda* O.S. and *Zenillia virilis* A. & W. with Notes on *Zenillia blandita* Coq. (Diptera, Tachinidae).**—*Ann. Ent. Soc. Amer.*, xxiii, no. 3, pp. 569–576, 1 fig., 7 refs. Columbus, Ohio, September 1930.

Many collections of native insects are reared annually at the Gipsy Moth Laboratory for the purpose of ascertaining to what extent introduced parasites of *Porthetria dispar*, L. (gipsy moth) and *Nygmia phaeorrhoea*, Don. (brown-tail moth) are attacking native hosts in the United States. In reared specimens, differences were observed between the males, females and puparia of *Zenillia blanda*, O.S., which attacks *N. phaeorrhoea*, and *Z. virilis*, Aldr. & Web., which parasitises *P. dispar*, and the latter, which was previously treated as a subspecies, is therefore raised to specific rank. The characters distinguishing these species and *Z. blandita*, Coq., are discussed and a key is given for their identification, which is designed to fit into Aldrich and Webber's key to the genus *Zenillia* [xii, 214]. A list is given of the Lepidopterous hosts from which *Z. blanda* and *Z. virilis* were reared. The larvae of both these species normally emerge from the host pupa, but occasionally form their puparia within it. Moreover, individual records show that both forms hibernate as maggots within the host pupa. In the cases under consideration if the hosts produced adults in the same season, both parasites completed their development in that season; but if the hosts passed the winter in the pupal stage and emerged in the following spring or summer, the flies also emerged in the following year. The adults of the summer generation emerged from the middle of July until the autumn, and those of the overwintering generation from spring until the early part of August. These two species were found to have five hosts in common.

Smith (H. D.). **The Bionomics of *Dibrachoides dynastes* (Foerster), a Parasite of the Alfalfa Weevil.**—*Ann. Ent. Soc. Amer.*, xxiii, no. 3, pp. 577–593, 1 pl., 13 refs. Columbus, Ohio, September 1930.

Investigations on *Dibrachoides dynastes*, Först., which is considered to be the most important parasite of the prepupa and pupa of *Hypera variabilis*, Hbst. (*Phytonomus posticus*, Gyll.), were carried out in the course of rearing work at the parasite laboratory at Hyères, France. In this vicinity the eggs of *H. variabilis* are found from January to May, inclusive, in dry or green stems of lucerne. The first larvae

appear in the early part of March, feed inside the stalk for several days and then crawl to the leaf buds and leaves to complete their development. About the middle of April they drop to the ground and spin their cocoons, which are usually found attached to dead leaves or rubbish. The adults emerge during the latter part of April and remain in a diapause until the following December. The larvae of the main brood appear towards the end of March and form their cocoons during the first part of May. The adults emerge a week or two later and also remain in a diapause. Occasionally a few weevil larvae may be found in the field in summer and autumn.

In one heavily infested locality near Hyères in 1929, the rate of parasitism by *D. dynastes* was 5 per cent., and this appears to be about the maximum. After lying quiescent for 3–20 hours within the host cocoon, the adult parasites emerge, but females do not pair until the second day. Pairing took place readily at any time of the day in vials, 8 by 1·5 cm., at temperatures of 18–28° C. [64·4–82·4° F.], and somewhat more rapidly if the sexes were kept apart for 2 days after emergence.

Oviposition, which generally begins on the third day after emergence, takes place at any time of the day or night at temperatures of 18–30° C. [64·4–86° F.], the optimum being about 23° C. [73·4° F.]. Before depositing eggs, the female stings the prepupa or pupa to paralyse it and then makes a feeding tube through which to suck the body juices of the host. The processes of feeding and oviposition are described in detail. If suitable host material is available at temperatures of 20–30° C. [68–86° F.], the egg-laying period lasts from two weeks to a month. The maximum number of eggs laid by a single female was 122, deposited over a period of four weeks. The maximum number of eggs found on a single host was 16, the average numbers on 50 hosts being 3 on prepupae and 4 on pupae. At temperatures ranging from 25 to 30° C. [77 to 86° F.], the incubation period lasts $1\frac{1}{2}$–2 days, depending on the position of the eggs on the host. If the eggs are placed under wing pads or in the crevices between the segments of the prepupae, where it is more humid, they hatch in a minimum of time with practically no mortality, whereas if they are placed on the exposed surface some of them dry up and fail to hatch, and the incubation period of the others is slightly increased. All stages of the insect are described. The length of time required for development of the various stages, taking the average for 25 individuals, was egg $1\frac{3}{4}$, larva 5, prepupa $\frac{1}{3}$, and pupa 5 days at 25–30° C. and $3\frac{1}{2}$, 9, $1\frac{1}{2}$ and 11 days respectively at 18° C. Three or four larvae develop satisfactorily in a single host, but if there are five, the resulting adults are small. Reproduction may take place parthenogenetically, the progeny all being males.

In the vicinity of Hyères, *D. dynastes* normally has two generations a year. The overwintering females parasitise the first weevil cocoons, which appear about the middle of April. From the first to the second week in May the females of the first generation of the parasite emerge and attack the host cocoons. At this time, however, the weevils are practically all in the cocoon stage and are rapidly becoming adults, so that the parasite cannot lay the normal number of eggs owing to lack of hosts. The second generation of the parasite is, therefore, less numerous than the first. Experiments indicate that it passes the winter as an adult. No hyperparasites were observed, though one has been recorded elsewhere [*R.A.E.*, A, xiii, 47]. *D. dynastes*

has also been obtained from *Hypera nigrirostris*, F. [in Washington (viii, 223)], and the author has bred it in the laboratory from *H. punctata*, F., as many as 13 full-sized adults being obtained from one cocoon.

FLANDERS (S. F.). **Notes on the Life-history of** *Lindorus lophanthae*.—*Ann. Ent. Soc. Amer.*, xxiii, no. 3, pp. 594–596, 2 figs. Columbus, Ohio, September 1930.

The Coccinellid, *Rhizobius* (*Lindorus*) *lophantae*, Blaisd., is a common predator of red scale [*Chrysomphalus aurantii*, Mask.] in California. Although larvae of the third and fourth instars appeared to prefer eggs of the black scale [*Saissetia oleae*, Bern.], newly-hatched larvae placed on these eggs took three times as long to moult as those fed on *C. aurantii*, and a large number died. Moreover, all larvae of the second instar died when an abundance of *S. oleae* was present. It was, however, found necessary to use eggs of *S. oleae* to stimulate egg deposition. Oviposition in the field probably occurs on the limbs [of *Citrus*] bearing fruit infested with *C. aurantii*; no eggs were observed on the fruit. Pairing takes place readily in confinement. Oviposition begins on the third day after emergence and may extend over a period of 20 days. As many as 144 eggs were laid by a single female among eggs of *S. oleae*, the maximum for one day being 25. The egg stage lasted 5–6 days, the larval 14–18, and the pupal 4–5.

Many larvae can be reared in a small container, such as a petri dish 4 inches in diameter, without a high degree of cannibalism. Of 120 larvae placed in such a container, 95 per cent. were successfully reared. The pupal stage is most subject to injury by the larvae.

HERTZER (L.). **Response of the Argentine Ant** (*Iridomyrmex humilis*, **Mayr**) **to external Conditions.**—*Ann. Ent. Soc. Amer.*, xxiii, no. 3, pp. 597–600. Columbus, Ohio, September 1930.

Experiments made in California are described in which the response of *Iridomyrmex humilis*, Mayr, to varied conditions of humidity, temperature and light was tested. It was found that the larvae are kept for choice in a relatively humid place, eggs in a slightly less humid situation, and pupae in almost dry soil. Very damp soil is avoided. Where temperature was the only factor, the workers chose for the young temperatures varying from 70–83° F., 80° being selected most often. When humidity was also a factor, a lower temperature was chosen in order to obtain greater humidity, if moisture was not available at higher temperatures. In general, workers tending the young show a definitely negative reaction to light, and young have never been observed in direct light in the field.

HERTZER (L.). **Studies on the Argentine Ant Queen** (*Iridomyrmex humilis*, **Mayr**).—*Ann. Ent. Soc. Amer.*, xxiii, no. 3, pp. 601-609. Columbus, Ohio, September 1930.

An account is given of observations on the habits of the queens in colonies of *Iridomyrmex humilis*, Mayr, in relation to the workers, and on the hostility exhibited by both queens and workers on certain occasions.

SNAPP (O. I.). **Life History and Habits of the Plum Curculio in the Georgia Peach Belt.**—*Tech. Bull. U.S. Dept. Agric.*, no. 188, 90 pp., 10 pls., 7 figs., 10 refs. Washington, D.C., September 1930.

A detailed account is given of investigations of the life-history of *Conotrachelus nenuphar*, Hbst., as a pest of peaches, carried out in central Georgia during the seasons 1921–24, subsequent to a severe infestation in 1920 [*cf. R.A.E.*, A, xvi, 143, 636, etc.]. The four years' results show the average number of eggs deposited by a single female to be 64·64 for the first and 40·21 for the second generation, the maximum being 516. The egg stage lasted from 2 to 7 days, being usually a little longer in the first than in the second generation. The time spent in the fruit by the first generation larvae ranged from 21·5 days for those entering in April to 12·4 for those entering in July. Second generation larvae reached maturity in 12·7 days during June, July and August. The average time spent in the soil as larva, pupa and adult was 34·16 days for the first generation and 30·43 for the second.

The weevils enter hibernation in the latter part of August and earlier part of September and emerge during March and April, the time of emergence and rate of winter survival being greatly dependent upon climatic conditions. The maximum emergence of first generation beetles occurs in June. In 1922 a few individuals of a third generation occurred, but in 1923 there was not even a second generation. Some of even the first generation beetles may enter hibernation a second time, but have not been observed to survive the second winter. Of the second generation beetles emerging from hibernation during March and April 1923, 33·3 per cent. entered hibernation again. One female survived and lived nearly two years, depositing eggs in 1923, but not in 1922 or 1924. Data are given showing the comparative rates of mortality among beetles hibernating in various kinds of material in exposed and sheltered positions and at varying depths of soil. The relation of climatic conditions to the occurrence of the weevil during the investigation is discussed.

The most common parasite of *C. nenuphar* is *Triaspis curculionis*, Fitch, which was reared from the larvae during each of the four years of the investigation, together with *T. curculionis* var. *rufus*, Riley. The rate of parasitism varied considerably, being highest (21 per cent.) in 1924. Other parasites included *Myiophasia globosa*, Towns., and *Cholomyia longipes*, F., which attacked the larvae, and *Anaphoidea conotracheli*, Gir., the only egg parasite. Tables are given showing comparative dates of emergence and rates of parasitism of all these species in each year of the investigation.

Control measures include jarring the trees and destroying the beetles caught, gathering dropped peaches and burying them with quicklime and disking the soil during the period of pupation. In tests of various insecticides carried out throughout the four years of the investigation, the most satisfactory results were secured with acid lead arsenate as a spray or dust [*cf.* xv, 590].

Conotrachelus anaglypticus, Say, was observed among collections of *C. nenuphar* taken in peach orchards in April 1922. Subsequent records and observations indicate that a small proportion of the injury to peaches hitherto attributed solely to *C. nenuphar* is due each season to the work of this weevil, the life-history of which is similar. The observations also definitely establish that *C. anaglypticus* injures sound peaches [*cf. R.A.E.*, A, xii, 544].

Pack (H. J.). **Notes on miscellaneous Insects of Utah.**—*Bull. Utah Agric. Expt. Sta.*, no. 216, 30 pp., 8 figs. Logan, Utah, April 1930.

This bulletin has been compiled by G. F. Knowlton from unpublished notes of the late author, based chiefly on observations made in 1929.

Severe losses have been caused in recent years to gooseberries and currants in Utah by *Zophodia grossulariae*, Riley (gooseberry fruit-worm). In 1929, the moths were observed from 16th April to 13th June. Oviposition began as the plants began to blossom, and was heaviest when most of the flowers were open, about 4th May. Eggs may be laid on any part of the plant, but are chiefly deposited in or on the flowers until the floral cup closes and the sepals begin to fade. Incubation varied from 7 to 15 days, depending largely on temperature, and during the spring the average length of the larval life was 30 days. A larva entering a berry rejects the first mouthfuls of food ; the entrance is almost invariably made at the calyx or stem end of the fruit, though the exit holes are often in the side. The larvae are mostly mature by the time the gooseberries are picked (about 16th June) and crawl down into the rubbish under the bushes, where they spin loose cocoons. The pupal stage lasts about 10 months. The pupae are parasitised by *Ephialtes sanguineipes*, Cress., of which there are two generations annually, adults emerging from overwintered pupae about 12th May to 1st June and those of the next generation from 4th to 29th July. The latter pair within a few hours and oviposit in the pupae. Only one parasite was observed to emerge from one pupa. Two individuals of *Mesostenus gracilis*, Cress., were obtained from pupae in July. Remedial measures against *Z. grossulariae* have only been tried for two seasons, but when a spray of 7 lb. lead arsenate in 100 U.S. gals. water was applied into the calyces of gooseberries and currants before they closed, the loss of crop was about 10 per cent. as compared with from 50 to nearly 100 per cent. on untreated bushes.

Recurvaria nanella, Hb. (lesser bud moth) caused moderate injury to apple trees in 1929, the larvae webbing the leaves together and feeding within the shelter ; this pest is widely distributed in Utah, and adults were observed to live as long as 24 days. *Eucosma* (*Spilonota*) *ocellana*, Schiff. (bud moth) attacks both apple and cherry trees in northern Utah, feeding on the lower surface of the leaves for preference. *Anarsia lineatella*, Zell. (peach twig-borer) has three generations annually in Utah, larvae of the first generation attacking chiefly the fruit of apricots and those of the second plums or occasionally peaches ; the seasonal history of the generations is discussed. Of larvae of the first generation, 47·6 per cent. were parasitised by the Encyrtid, *Copidosoma pyralidis*, Ashm., and of the second generation 9·3 per cent. The codling moth [*Cydia pomonella*, L.] has three generations a year in Utah, but many of the first and second brood larvae overwinter. *Coleophora fletcherella*, Fern. (cigar case-bearer) has been found on apple and cherry leaves.

Hulstia undulatella, Clem. (sugar-beet crown borer) was abundant on beets in 1929, but in many years is quite scarce. *Porosagrotis orthogonia*, Morr. (pale western cutworm) caused serious damage to winter wheat and spring-sown barley ; many of the pupae are parasitised by the Bombyliid, *Villa* (*Anthrax*) *lateralis*, Say, and some by a Braconid, near *Chelonus sericeus*, Say. *Phytometra* (*Autographa*) *cali-*

fornica, Speyer (alfalfa semi-looper) was collected on lucerne; the egg and the process of hatching are described. *Otiorrhynchus* (*Brachyrrhinus*) *ovatus*, L. (strawberry root weevil) is the most serious pest of strawberries in Utah and entails the ploughing up of many beds by the end of the third year. The life-history is outlined. Cultural methods seem to assist in control, but the essential remedy is to kill the adults before oviposition, which is done by spreading poison bait as soon as the crop is harvested. *O.* (*B.*) *sulcatus*, F. (black vine weevil) and *O.* (*B.*) *rugifrons*, Gyll. (rough strawberry weevil) also cause some damage to strawberries in northern Utah. *Anasa tristis*, DeG. (squash bug) destroys squash plants by the inoculation of some toxic substance in feeding or possibly of a disease, which causes wilting and ultimate drying of the leaves and finally of the whole plant. If a disease organism is concerned, it can be transmitted through the egg from one generation to the next. The best results against the bug were obtained by dusting with calcium cyanide. *Paratrioza cockerelli*, Sulc, is sometimes abundant on potatoes, and appears to be the cause of a disease known as Psyllid yellows [*R.A.E.*, A, xvii, 281], which first appeared in Utah in 1927. In northern Utah, *Harmolita grandis*, Riley, is numerous and destructive to wheat; there are two generations a year, the larvae hibernating in the stubble and pupating early in the spring. *H. vaginicola*, Doane, and *H. tritici*, Fitch, are somewhat less abundant; they have only one generation a year and emerge later than *H. grandis*. The degree of parasitism of these species is fairly high.

A list of 88 species of Lepidoptera occurring in Utah is appended, and a supplement contains observations made by the author in collaboration with C. H. Smith on *Heliothrips fasciatus*, Perg. (bean thrips) and other Thysanoptera, and with L. C. Fife on *Hypera punctata*, F. (clover leaf weevil). Several generations of *H. fasciatus* occur in a year; the thrips do not attack the bean pods until the more tender leaves and flowers have become dry. The other Thysanoptera recorded are *Aeolothrips fasciatus*, L., on oats; *Sericothrips variabilis*, Beach, on box-elder [*Acer negundo*]; *Frankliniella occidentalis*, Perg., and *F. moultoni*, Hood, on lucerne and in clover blooms, and the former also on cabbage and maize tassels; *Thrips tabaci*, Lind., on cabbage and onions; *Neoheegeria verbasci*, Osb., on mullein [*Verbascum*]; and *Leptothrips mali*, Fitch, on cherry and apple leaves. The life-history of *Hypera punctata* is recorded in some detail. The eggs are generally laid in lucerne stems lying on the ground, and the larvae feed both day and night. Hibernation occurs in the egg, larval and adult stages. Of the overwintering eggs only 27·7 hatched, the high mortality being largely due to the Mymarid parasite, *Anaphes pratensis*, Frst., and many adults were found covered with the fungus, *Beauveria* (*Sporotrichum*) *globulifera*. The adults are strong fliers and are also carried by irrigation water, on which they float.

DRAKE (C. J.). **A new Sugar-cane Tingitid from Java and Sumatra (Hemiptera).**—*Pan-Pacific Ent.*, vii, no. 1, pp. 15–16. San Francisco, Cal., July 1930.

Abdastartus sacchari, sp. n., is described from Java, Sumatra and Formosa. It was previously erroneously recorded by the author from Java and Formosa as *A. tyrianus*, Dist., the characters distinguishing them being indicated.

FLANDERS (S. E.). **Races of** *Trichogramma minutum.*—*Pan-Pacific Ent.*, vii, no. 1, pp. 20–21. San Francisco, Cal., July 1930.

Brief reference is made to previous observations on colour races of *Trichogramma* [*cf. R.A.E.*, A, xv, 653; xviii, 369, 471]. In North America no thelyototokous strain has been observed. In studying the strains resembling *T. minutum*, Riley, from Mexico and various localities in the United States, the author was able to classify them according to the colour of the females and the life-cycle into five races, which, when reared on eggs of *Sitotroga cerealella*, Ol., at constant temperatures, maintain their distinctive characteristics for generations. The males are normally winged. The differences in the length of the life-cycles of the various races are very apparent when they are reared at a constant temperature of 60° F., those with the shorter life-cycles having apparently the higher optimum developmental temperatures.

The races, which are briefly described, are, in order of their lengthening life-cycles: the dark, short-cycle race from the west coast of Mexico and southern California (life-cycle at 81° F., 7 days); the yellow race from Massachusetts, Illinois and California; the transition race from California; the grey race from Louisiana and Georgia (life-cycle at 81° F., 8 days); and the dark, long-cycle race from California and Massachusetts (life-cycle at 81° F., 8 days).

VILLENEUVE (J.). **Propos diptérologiques. I. Sur le genre** *Lydella* **Rob.-Desv.**—*Bull. Ann. Soc. ent. Belg.*, lxix, no. 4, pp. 103–105. Brussels, 15th May 1929.

VILLENEUVE (J.). **Sur le genre** *Ceromasia* **Rond. apud Stein.**—*Konowia*, ix, no. 3, pp. 217–220. Vienna, 20th October 1930.

The author differs from the views of previous workers as to the identity and scope of the genus *Lydella*. In his opinion it includes the single species, *L. stabulans*, Mg., of which *grisescens*, R.-D., is a subspecies, both of these being parasites of *Pyrausta nubilalis*, Hb.

Ceromasia senilis, Mg., Rond., which is the type of its genus, and of which *C. juvenilis*, Rond., Girschn. [*R.A.E.*, A, xviii, 440] is a colour variation, is identical with *grisescens*, so that *Ceromasia* is a synonym of *Lydella*. The colour variation *juvenilis* is the form most often obtained from *P. nubilalis*. *L. lepida*, Mg., is a synonym of *L. stabulans*, but *L. lepida*, Mg., Stein [xvii, 215] is *L. stabulans grisescens*.

HOWARD (L. O.). **A History of Applied Entomology (Somewhat Anecdotal).**—*Smithson. Misc. Coll.*, lxxxiv (Pub. 3065), viii + 564 pp., 51 pls. Washington [D.C.], 29th November 1930.

In this work the author has collected a very large amount of data on the history of applied entomology throughout the world. He is greatly to be congratulated on the completion of this difficult task, though there is necessarily some inequality in the treatment of the many countries involved, owing to difficulties in obtaining information from those in which less attention is paid to the subject.

In the latter portion of the book a section is devoted to medical entomology and also to important modern developments, such as the

use of predatory and parasitic insects in the biological control of insects and of weeds.

An interesting comparative table of the amount of publication by different countries is also given, and it is a source of gratification to the staff of the Imperial Institute of Entomology to find the distinguished author expressing the view that "possibly in publishing its very competent *Review*, it has done the greatest single service to applied entomology that can be thought of by the present writer."

PEARSON (R. S.). **Report of the Forest Products Research Board for the Period ended 31st December 1929.** —Med. 8vo, 54 pp. 18 figs. London, H.M.S.O., 1930. Price 4s. net.

Research on entomological problems is described by R. C. Fisher on pp. 34–42.

The investigation of the losses caused by powder-post beetles, *Lyctus* spp. [*R.A.E.*, A, xvii, 254], has been continued. The damage has increased and concerns not merely the furniture trade but all industries using hardwoods that are susceptible to attack, such as oak, walnut, ash and elm. Survey work in 1929 showed that large quantities of timber are imported into Great Britain in an infested condition ; this applied particularly to American red and white oak and recently imported Austrian oak. *L. linearis*, Goeze, and *L. brunneus*, Steph., have been found abundantly in home-grown timbers, the former also occurring frequently in imported European oak. *L. planicollis*, LeC., and *L. parallelopipedus*, Melsh., were found only in American oak and ash.

The past four years' work has shown that much could be done to prevent damage from *Lyctus* by careful inspection, if all those concerned would co-operate. For manufacturers possessing seasoning kilns, a simple means of steam sterilisation has been described [*loc. cit.*]. Recent experiments have shown that a temperature of 125° F. with 80 per cent. humidity may prove sufficient to kill the insects, provided that the infested timber is treated over a requisite period, which has not yet been finally determined. This sterilisation does not, however, prevent re-infestation.

Investigations into the life-histories of furniture beetles have been continued. It has generally been considered that the normal life-cycle of *Anobium punctatum*, DeG., covers one year only, but it is now found that it may extend over more than two. Larvae hatching in August 1927 had not completed their development 2½ years later. The progress of attack depends not only on the nature of the wood, but also on conditions of humidity and temperature. *Xestobium rufovillosum*, DeG. (death watch beetle) in the laboratory showed a distinct preference for ovipositing in willow, though oak, pine and spruce were also utilised. The incubation period varied from 2 to 6 weeks or longer, according to the temperature and humidity. It is hoped to determine the optimum conditions of temperature and humidity for the development of this Anobiid ; the death rate of newly emerged larvae is extremely high, which probably accounts partly for the slow progress of infestation in buildings. It is thought that a high moisture content in the timber may be necessary for the young larva to commence boring. It seems evident that the presence of fungus in wood has some relation to infestation by Anobiids and Lyctids ;

in every sample examined, fungus mycelium was found in the neighbourhood of the insects' tunnels, and it is thought that yeast cells in special appendages of the mid-gut of Anobiid and other wood-boring insects may be in some way associated with breaking down the cellulose of the wood and making it available for the larvae [*cf.* *R.A.E.*, A, xvi, 213]. Both *Lyctus* and *Xestobium* attack oak, but have never been found together; the larvae of the former attack only the sapwood during or shortly after the seasoning process, whereas those of the latter cannot develop until the wood has aged and some chemical or physical change has taken place. The actual food of both is, however, unknown [see next paper].

Three Siricids, namely, *Sirex cyaneus*, F., and *S. gigas*, L., in conifers, and *Xiphidria ? prolongata*, Geoffr. (*dromedarius*, F.) in willow, were used in studies, in conjunction with R. N. Chrystal, of the association of fungus with wood wasps. The examinations, which are described in detail, showed that all three species contained fungi in glands situated at the base of the ovipositor [*cf.* xvi, 213]; the insects definitely inoculate the wood with the fungus during oviposition. All the fungi as yet isolated belonged to the group Thelephoraceae, and were apparently of the genus *Stereum*. It will probably be found that a specific fungus is associated with each insect.

Standard tests of antiseptics for the prevention of insect attack, which are described, have shown that zinc chloride solutions, in concentrations varying from 0·1 to 2 per cent., prevent neither oviposition of *Lyctus* nor the hatching of the eggs and initial feeding of the larvae, though the latter are eventually killed. In the case of a proprietary salt tested, oviposition was not prevented at the concentrations tested (0·05 to 1 per cent.), but fertile eggs did not hatch in wood treated with solutions of more than 0·2 per cent. Even at lower concentrations, numbers of eggs were destroyed though some larvae hatched and began tunnelling; the maximum period of survival of a larva was one month in wood treated with 0·05 per cent. strength.

CAMPBELL (W. G.). **The Chemical Aspect of the Destruction of Oak Wood by Powder Post and Death Watch Beetles**—*Lyctus* **spp. and** *Xestobium* **sp.**—*Biochem. J.*, xxiii, no. 6, pp. 1290–1293, 3 refs. Cambridge, 1929. [Recd. October 1930.]

From a chemical analysis of sound English oak sapwood and frass from *Lyctus* boring in the same wood, it is concluded that the source of larval nourishment is within the cells and not in the cell wall substance, but in the case of *Xestobium* [*rufovillosum*, DeG.] feeding in English oak heartwood, analysis of the frass and of sound wood indicates that the larvae attack the carbohydrates of the wood substance.

THOMPSON (H. W.). **Control of Root Flies in South Wales.**—*Welsh J. Agric.*, vi, pp. 295–301, 1 pl. Cardiff, January 1930.

In South Wales, *Phorbia* (*Chortophila*) *brassicae*, Bch., *Hylemyia antiqua*, Mg., and *Psila rosae*, F., cause considerable damage to crucifers, onions and carrots respectively, 50 per cent. or more of a crop extending over several acres being sometimes injured.

Mercury bichloride gives a reasonable amount of control against *P. brassicae*, but its use is considered undesirable in view of its poisonous

nature and the labour involved. Experiments in 1928, the object of which was to prevent oviposition by the flies, showed that grade 16 naphthalene was much superior to any of the other chemicals tested. During the tests against *Psila rosae*, although infestation was almost absent on the carrots during the time of examination, quite a high percentage became infested later in the season. This was apparently due to the fact that the carrots were late owing to seed germination being checked by the severe drought that occurred during that year, so that although they had almost escaped infestation by the first brood, they subsequently became infested by a later one from neighbouring plots.

In tests against *Phorbia brassicae*, in the summer of 1929, naphthalene, at the rate of $\frac{1}{4}$ oz. to each plant, was applied on 17th June and again on 2nd July to a small plot of cauliflowers. A proprietary insecticide, consisting almost entirely of lime with a small proportion of naphthalene, was applied to a neighbouring plot of cauliflowers on the same dates at the rate of 8 cwt. to the acre. Inspections on 22nd July and again a month later showed that the plants treated with naphthalene were free from infestation; the proprietary insecticide had apparently no deterrent action on the flies, and in addition the unslaked lime that it contained had in some cases a scorching action on the stems of the plants, killing many of them. On another plot 7 per cent. of the plants treated with naphthalene were killed by the flies as compared with 72 per cent. of the plants that were killed on an untreated plot. In tests against this fly on savoys and cauliflowers, one plot was treated with a solution of mercury bichloride (1 oz. to 8 gals. water) used at the rate of $\frac{1}{4}$ pint to each plant, and a second with naphthalene, both being applied on 12th and 22nd June and 2nd July. The eventual amount of infestation was 9 per cent. on the first plot, 3 per cent. on the second, and 23 per cent. on an untreated one.

The results of tests against *H. antiqua* on onions, which were treated with naphthalene (again at the rate of $\frac{1}{4}$ oz. to each plant) on 4th and 16th May and 2nd June, and examined on 29th June and 20th July, showed that less than 1 per cent. of the plants on the treated plot had failed as compared with 75 per cent. among the controls.

In 1929 *Psila rosae* was much less abundant than in previous years. In tests against this fly a plot of carrots, sown on 13th April, was treated with three applications of naphthalene at intervals of 10 days between each application, the first being made on 8th June. The plants were examined 5 weeks after the last application, but the percentage of those attacked was very low. At lifting time, however, 12·7 per cent. of plants from the treated plot and 15·4 per cent. of those from the untreated one were infested.

Balachowsky (A.) & Molinari (L.). **L'extension de la cochenille australienne** (*Icerya purchasi* **Mask.**) **en France et de son prédateur** *Novius cardinalis* **Muls.**—*Ann. Epiphyties*, xvi, no. 1, pp. 1–24, 4 maps, 2 figs., 24 refs. Paris, 5th August 1930.

The history of the introduction and spread of *Icerya purchasi*, Mask., in France, Corsica and Algeria is given, and illustrated by maps. The area over which it may become distributed is limited by certain ecological factors. High temperatures do not appear to exert much influence provided that there is sufficient humidity, the Coccid

having survived for two years in the Biskra oasis where the summer temperature frequently reaches 45° C. [113° F.]. On the other hand it is very susceptible to prolonged cold and does not seem able to establish itself in regions where the winter is regular although not very severe. The winter of 1928–29 was particularly severe in the south of France, and a large number of foci of *I. purchasi* disappeared in consequence. Mountain ranges form an insurmountable barrier both in France and Algeria, and in the latter country the high plateaux are not invaded, owing to the low temperatures prevailing during the winter nights. The optimum condition for the development of *Icerya* appears to be a mild subtropical climate, such as that of Algiers, where the humidity is high and the average temperatures for January and July are 13° C. [55·4° F.] and 23° C. [73·4° F.] respectively. Although it is numerous in such places as Algiers, where the humidity frequently reaches 100 per cent., it develops well on arid, sunny slopes in the Alpes Maritimes and Var (where the humidity is 30–40 per cent.), and thus appears to be less exacting in its requirements regarding humidity than certain other introduced Coccids.

A list is given of the food-plants of *I. purchasi*, which are briefly discussed. Although it may attack numerous species, its normal food-plants are such introduced ones as *Acacia* spp., *Pittosporum tobira* and all varieties of *Citrus*, and certain wild plants, including *Spartium junceum* [*cf. R.A.E.*, A, xviii, 365]. Its dispersion by transport of infested plants and by the wind is discussed.

The establishment and distribution of the Coccinellid, *Novius cardinalis*, Muls., for the control of *I. purchasi* in France and Algeria is reviewed. In the western basin of the Mediterranean there appear to be 3 generations of the Coccid annually as a general rule, although all stages may be found practically throughout the year. No hatching occurs, however, from November to the middle of February. On the other hand *N. cardinalis* does not appear until May or June. From this time until October, it is extremely abundant and rapidly destroys colonies of *I. purchasi*. Six generations occur during this period. Thus, before the Coccinellid appears in the spring and after it has hibernated in the winter, the Coccid is able to reproduce without hindrance. The special attraction of *I. purchasi* for *N. cardinalis* is discussed; new infestations can only take place from October to May when the Coccinellid is hibernating, otherwise it would destroy the pest and then die out itself through lack of food. *Eublemma* (*Coccidiphaga*) *scitula*, Rbr., a predator that feeds on the eggs of various scale-insects, was obtained several times in the course of rearing work in Algeria, but its action against *I. purchasi* appears to be accidental and is only observed in certain cases where large masses of the Coccid are found on vegetation where the predator occurs.

I. purchasi does not yet appear to have reached the limits of its distribution in France, and it seems probable that the centres of infestation on the Atlantic sea board will extend to meet those on the Mediterranean coast by way of the valley of the Garonne and lower Languedoc.

MARTELLI (G.). **Lotta antiacridica in Puglia durante la campagna 1929.**—4 pp. [Taranto] 1930.

An account is given of a successful campaign in 1929 against *Dociostaurus maroccanus*, Thnbg., in Apulia, where a serious invasion

occurred in the spring and summer. The measures consisted of spraying with a 1·5 per cent. tar distillate, alone or mixed with sodium arsenite, and the use of poisoned baits prepared by saturating bran with a 5 per cent. solution of sodium arsenite.

NOVAK (P.). **Insect Pests of Dalmatia.** [*In Serbian.*]—*Glasnik hrv. prirodosl. Dr.*, xxxix-xl, pp. 109–133, 2 refs. Zagreb, 1928.

This review of insect pests of crops, forests and stored products in Dalmatia is based partly on observations carried out by the author in 1924–26 and partly on those of other workers in previous years, and includes notes on their distribution and seasonal occurrence, and in some instances the amount of damage they cause. *Chrysanthemum* (*Pyrethrum*) *cinerariaefolium* was frequently attacked by insects that occurred on other plants growing near it, the species observed including the Cetoniids, *Epicometis* (*Tropinota*) *hirta*, Poda, and *T. squalida*, Scop., and the Alleculid, *Podonta dalmatina*, Baudi.

[PANTELEEV (A. M.) & OTHERS.] **Пантелеев (А. М.) и другие. A Handbook on the Control of Pests and Diseases of cultivated graminaceous Plants in large agricultural Farms.** [*In Russian.*] —Demy 8vo, 213 pp., 83 figs., 25 refs. Moscow, Knigosoyuz, 1929. [Recd. 1930.]

In this handbook 65 pages are devoted to notes on the distribution and bionomics of the more important insect pests of cereals in the Russian Union and agricultural methods of controlling them. A key to some of the insects in the stage in which they attack the plants is included, based on their morphological characters and the injury caused. A section of 6 pages deals with chemical methods of control and spraying and dusting machinery, and one of 23 pages with the chief pests of stored grain and measures against them.

[KONAKOV (N. N.).] **Конаков (Н. Н.). Historische Kenntnisse über die Vermehrung von** *Loxostege* (*Botys*) *sticticalis* **L. im Zentral-Schwarzerdebodengebiete (U.S.S.R.).** [Historical Notes on the Outbreaks of the Meadow Moth in the Black Soil Zone of Central Russia. (*In Russian.*)]—*Mater. po Izuchen. lugov. motuil.* Loxostege sticticalis *L. v Tz. Ch. O.* [*Materials for the Study of the Meadow Moth,* Loxostege sticticalis, *L., in the central Black Soil Zone*], reprint 38 pp., 137 refs. Voronezh, Izd. Sta. Zashch. Rast. Oblzemupravl. Tz. Ch. O., 1930.

This paper is compiled from the literature and reviews the outbreaks of *Loxostege sticticalis*, L., in central Russia since the year 1855. These the author divides into three groups : severe outbreaks, when the whole of the Black Soil Zone was infested ; outbreaks that occurred in a part of the region only ; and small infestations limited to one or two districts. The increase in numbers of the moths usually occurs two years before a serious outbreak takes place, starting in the south and gradually spreading northwards ; sometimes, however, such an outbreak may occur unexpectedly, as was the case in 1929, when the infestation of the whole Zone was extremely severe.

On comparing the incidence of sun spots in different years with the periods of the outbreaks, the author concludes that there exists a definite relation between these phenomena. Each of the five severe outbreaks that occurred between 1855 and 1916 took place either in a year when there was a minimum of sun spots or in the preceding one. This may be explained by the fact that a decrease in the number of sun spots coincides with periods of frequent rainfall, high humidity being favourable to the pest, but forecasts of severe outbreaks should not be based exclusively on the number of sun spots. From 1916 to 1923, local outbreaks occurred every year irrespective of the number of sun spots, being probably due to the presence of large uncultivated areas of land overgrown with weeds.

The relation between outbreaks of *L. sticticalis* and those of *Phytometra* (*Plusia*) *gamma*, L., are discussed. These pests attack the same plants, but prefer different varieties. *L. sticticalis* occurs chiefly in the south of European Russia, whereas *P. gamma* is common in the northern half, although owing to cold and wet autumns the larvae very often cannot pupate and die in large numbers. The history of the outbreaks of *P. gamma* in European Russia since 1870 is briefly reviewed, and it is pointed out that they never coincide with those of *L. sticticalis*.

[DEMOKIDOV (K.).] **Демокидов (К.). The Pink Cotton Bollworm in Turkey.** [*In Russian.*]—*Khlopkovoe Delo*, viii, no. 10, pp. 1081–1093. Tashkent, 1929. [Recd. October 1930.]

An account is given of investigations carried out in Turkey from October 1928 to November 1929 on infestation of cotton by *Platyedra* (*Pectinophora*) *gossypiella*, Saund., and the possibility of its spread to the cotton plantations in Transcaucasia.

No trace of infestation by *P. gossypiella* was found in the cotton fields in the Igdir region, which is separated from the Armenian Republic only by the river Arax, about ½–1 mile wide. A few of the cotton bolls appeared to have been injured by *Heliothis* (*Chloridea*) *obsoleta*, F., but no insects were present. The two chief cotton-producing regions of Turkey, the Adan and Smyrna provinces, are on the contrary considerably infested with *P. gossypiella* and *Earias insulana*, Boisd., 9–11 per cent. of the cotton seed being found to be injured in Adan. Owing to extreme drought in the summer, no outbreaks of these pests occurred in Adan in 1928, and in the autumn many of the hibernating larvae of *P. gossypiella* were washed out of the soil by heavy rains and killed. On *Hibiscus* young larvae of *E. insulana* were found on 10th December and older ones in January. About 20 per cent. of the larvae of *P. gossypiella* were attacked by the mite, *Pediculoides ventricosus*, Newp. Considerable quantities of cotton are imported into the Russian Union from the Adan region, and as the cotton is not disinfected before export, the larvae of *P. gossypiella* might easily be carried in the many seeds that occur in bales of cotton. Although no larvae of *P. gossypiella* were present in cotton examined in two ginneries in the towns of Smyrna and Aidin, numerous traces of infestation by this pest and *E. insulana* were observed.

The possibility of the introduction of *P. gossypiella* into the Igdir region in cotton seed from Adan is discussed. Should this happen, the moths might easily fly across the river Arax into Armenia. The

existing regulation prohibiting the importation of cotton from the Igdir region could not prevent this and should therefore be withdrawn, but the imported cotton should not be taken beyond the boundaries of the Armenian Republic, and should be used in local ginneries only. The establishment of quarantine stations in the town of Igdir and on the Transcaucasian side is recommended.

[PANTELEEV (A. M.).] **Пантелеев (А. М.). The Organisation of Quarantine to prevent the Introduction from abroad of Pests of Cotton into U.S.S.R.** [*In Russian.*]—*Khlopkovoe Delo*, viii, no. 12, pp. 1437–1455. Tashkent, 1929. [Recd. October 1930.]

The economic importance of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., *Earias insulana*, Boisd., and the Mexican cotton boll weevil [*Anthonomus grandis*, Boh.] is briefly discussed, and notes are given on the history of the organisation of the quarantine service in Russia, which was inaugurated in 1914, against the first two pests. The work of the Quarantine Commission in 1927 and 1928 included investigations made in Turkey [see preceding paper] and Persia [*R.A.E.*, A, xvii, 125], which showed that although neither *P. gossypiella* nor *E. insulana* were present in regions adjoining the Russian Union, *Earias* has become established further south in Persia and both species in Turkey, so that infestation is liable to spread to Russia.

The work carried out in 1929 included further investigations on cotton pests in Persia and the establishment in Central Asia and Transcaucasia of a permanent quarantine inspection service. A vacuum apparatus has been ordered for the custom house in Markar for the fumigation of cotton imported from the Igdir region; and preliminary work has been carried out in connection with the organisation in Leningrad and Odessa of a service for the disinfection on a large scale of cotton seeds arriving from Egypt and America, especially in view of the fact that in the latter country seeds from areas severely infested with *A. grandis* are not being disinfected prior to export.

The plans of the Commission for 1930 include investigations in the cotton areas of Turkey, Afghanistan and western China.

[POPOV (P. V.).] **Попов (П. В.). Pests of Cotton in the new Cotton growing Regions.** [*In Russian.*]—*Khlopkovoe Delo*, ix, no. 2–3, pp. 349–353, 1 map, 6 refs. Tashkent, 1930.

A list is given of insect pests that have been recorded in the literature since 1925 as injuring cotton in the region of the Volga delta, the North Caucasus and Daghestan, with brief notes on their distribution and the amount of damage caused. The maize moth, *Pyrausta nubilalis*, Hb., is stated to have attacked cotton in small numbers in the Astrakhan district.

[EVSTROPOV (I. I.).] **Евстропов (И. И.). Pests of Cotton in Transcaucasia and how to control them.** [*In Russian.*]—Super Roy. 8vo, iii+87 pp., 42 figs. Tiflis, Izd. Zakavk. Khlopk. Komiteta, 1929. [Recd. October 1930.]

In this popular handbook an account is given of the bionomics of the more common pests of cotton in Transcaucasia, *viz.*, *Tetranychus*

telarius, L., *Aphis gossypii*, Glov., *Heliothis obsoleta*, F., *Euxoa segetum* Schiff., *Laphygma* (*Caradrina*) *exigua*, Hb., *Gryllotalpa gryllotalpa*, L., and Acridids. Notes on agricultural and chemical measures of controlling them are included, and a separate chapter deals with insecticides and spraying and dusting apparatus.

[VINOKUROV (G. M.) & RUBTZOV (I. A.).] **Винокуров (Г. М.) и Рубцов (И. А.). Studies on the Ecology of Grasshoppers in the Irkutsk Region.** [*In Russian.*]—*Bull. Irkutsk Plant Prot. Sta.*, no. 2, pp. 3–86, 16 refs. Irkutsk, 1930. (With a Summary in English.)

These studies were carried out in the summer of 1928 in the valleys of the River Ida and its tributaries in the Irkutsk region. A general geological and botanical account of the area is given; it has been almost entirely cleared of woods, which have been replaced by steppe vegetation. The clearing was accompanied by immigration of grasshoppers, which must have originated in the steppe and forest zone of the Siberian plateau.

The relations between different plant associations and various grasshoppers were established by mass collecting and statistical correlation between the relative abundance of plant and grasshopper species on each plot studied; descriptions of typical plots, with their vegetation and grasshopper fauna, are included. Certain species of plants and grasshoppers were always found together, and the former serve as definite indicators of the presence of the latter.

There are about twenty species of grasshoppers in the region, and they find most favourable breeding conditions in poor pastures covered with patches of scanty grass. The commonest is *Gomphocerus sibiricus*, L., which prefers habitats with communities associated with *Agropyrum cristatum*; these usually occur in dry valleys, with slightly clayey soil, poor in humus and saturated with carbonates. This species, however, has a considerable ecological plasticity, migrating in the hopper stage from one habitat to another, according to fluctuations in humidity; during dry periods it concentrates in damper habitats. Similar changes were observed in some other species, and it appears that the conditions of a habitat, particularly humidity and density of vegetation, are very important in this respect.

In order to eliminate conditions favourable for mass outbreaks of grasshoppers, pastures and waste places should be utilised for crops such as fodder grasses. In general, the grasshopper problem in Siberia can be solved only by intensification of agricultural development, which should be based on a thorough study of the ecology of grasshoppers in relation to agricultural practices.

[IL'ENKO (M. I.).] **Ильенко (М. И.). The Development and Metamorphoses of the Siberian Grasshopper** (*Gomphocerus sibiricus*, **L.**). [*In Russian.*]—*Bull. Irkutsk Plant Prot. Sta.*, no. 2, pp. 87–100, 18 figs., 10 refs. Irkutsk, 1930.

An egg-pod of *Gomphocerus sibiricus*, L., contains 7–10 eggs; under laboratory conditions one female was observed to oviposit 11 times. Hatching usually takes place in May, and the larval period averages

25 days, during which the larvae pass through 4 stages of approximately equal duration.

Detailed descriptions are given of the egg and egg-pod, the changes in the appearance of the eggs during embryonic development, the embryo before the winter diapause and before hatching, the process of hatching, the vermiform larva, the moults, and the four hopper stages, and the eggs and hoppers of all stages are figured. Some notes on the meteorological conditions accompanying the moults are included ; as a rule, moults do not take place in cold and wet weather.

[FRENKEL' (K.).] **Френкель (К.). Cutworms observed in the Irkutsk Region in 1927.** [*In Russian.*]—*Bull. Irkutsk Plant Prot. Sta.*, no. 2, pp. 105–113, 1 ref. Irkutsk, 1930.

In further observations on cutworms in the Irkutsk region [*cf.* *R.A.E.*, A, xvi, 296], the species occurring in 1927 included *Euxoa tritici*, L. (*Agrotis varia*, Alph.), which attacked cabbage, and *Agrotis phantoma*, Kozh., *E.* (*A.*) *islandica*, Stgr., and *E.* (*A.*) *cursoria*, Hfn., which were chiefly injurious to tobacco seedlings. In the Irkutsk region tobacco is usually planted out in the second half of June. During the day the cutworms drag the leaves into the soil, but at night they sometimes climb on to the plants to feed. Pupation occurred in the soil at the beginning of July, and the adults emerged in late July and the first half of August. Of the larvae kept in the insectary, 77 per cent. were parasitised by various Ichneumonids and Chalcids, and in one instance a Braconid occurred ; of the Ichneumonids one individual was identified as *Paniscus opaculus*, Thoms., and three as *Amblyteles* sp. Field experiments with poison baits were inconclusive, but in the laboratory a bait of moist rye bran containing sodium arsenite killed all the larvae in about 2 days.

Females of *Agrotis ditrapezium*, Bkh., which is also a pest of tobacco, taken on 1st August, oviposited in the insectary, one individual laying as many as 986 eggs in 9 days. The larvae hatched in 7–11 days and pupated in December. A revised description of the larvae is given, with a list of the cutworms found in the Irkutsk region.

[FRENKEL' (K. L.).] **Френкель (К. Л.).** *Ceuthorrhynchus jakovlevi* **Schze. and other Pests of Onion in the Irkutsk Region.** [*In Russian.*]—*Bull. Irkutsk Plant Prot. Sta.*, no. 2, pp. 115–126, 6 figs., 9 refs. Irkutsk, 1930.

Preliminary observations carried out in the summer of 1928 in the Irkutsk region indicated that 23 per cent. of the leaves of the onion plants examined were infested with eggs and larvae of various pests, most of which were not identified. *Ceuthorrhynchus jacovlevi*, Schulze, caused 1 per cent. of the damage, and the onion moth [*Acrolepia assectella*, Zell.], which was very common, infested as many as 60·5 per cent. of the plants in one district. The biology of *C. jacovlevi* [*cf.* *R.A.E.*, A, xviii, 54] is discussed, and all stages of this weevil are briefly described. The eggs were laid in the leaves at the end of June and hatched early in July, larvae being observed until 6th August. No pupae were found in the field, but adults were present from 22nd July to the end of August.

COTTIER (W.). **Experiments on Transmission of Dry-rot** (*Phoma lingam*) **of Swedes by Insects.**—*N.Z. J. Agric.*, xli, no. 3, pp. 194–199, 2 figs., 2 refs. Wellington [N.Z.], 20th September 1930.

An account is given of preliminary experiments conducted in New Zealand to determine whether a Drosophilid and a Staphylinid, both unidentified, are responsible for the transmission of dry rot (*Phoma lingam*) from infected to healthy swedes. These insects characteristically occur in dry rot lesions. The technique and the methods adopted are discussed. The sources of infection used were diseased roots taken from the field, artificially infected roots and cultures. The adult insects were taken from infected material and placed on a healthy root in a special receptacle, which is described. Only a small percentage of the roots developed the disease, but as none of the controls became infected, and the work was carefully done, it is considered that the evidence is sufficient to incriminate both the beetle and the fly. The conditions under which the experiments were carried out were very artificial, and the time that necessarily elapsed between taking the beetles from the infected material and placing them on a healthy root offered considerable opportunity for the separation of mechanically carried spores from the body of the insect. The method of carriage of the spores by the insects was not investigated.

MORRIS (H. M.). **Report of the Entomologist for 1929.**—*Ann. Rep. Dept. Agric. Cyprus 1929*, pp. 47–55. Nicosia, 1930.

Brief notes are given on the pests occurring in Cyprus in 1929. The spray used against *Eriophyes granati*, C. & M. (pomegranate mite) [*R.A.E.*, A, xviii, 4] is prepared as required by mixing 2 parts of sulphur with 1 of caustic soda and adding 250 of water. A survey of cotton fields during the summer indicated that *Platyedra gossypiella*, Saund. (pink bollworm) is much more abundant than *Earias insulana*, Boisd. (spiny bollworm). It appears that the latest bolls are very heavily attacked and that the damage is made more serious by the customary late sowing of cotton, large numbers of bolls being available when the insects are most prevalent. The date fixed for the compulsory destruction of cotton and *Hibiscus* plants was sixteen days earlier than in the previous year. Growers were notified that in 1930 this would be 30th November, and they were advised to sow their cotton earlier than is customary.

Pests not mentioned in the last report [*loc. cit.*] include: *Gryllotalpa gryllotalpa*, L., which caused a certain amount of damage, particularly in seed-beds; *Plutella maculipennis*, Curt., which injured cabbages and cauliflowers in some areas; *Hyponomeuta padellus*, L. (ermine moth), which caused considerable damage to apple; *Phthorimaea operculella*, Zell. (potato tuber moth), which chiefly injured potatoes in store; *Cydia pomonella*, L. (codling moth); *Ceratitis capitata*, Wied. (Mediterranean fruit-fly), which always causes considerable damage to oranges, apricots, etc.; *Eurytoma amygdali*, Endl., and *Scolytus amygdali*, Guér., attacking almonds; *Opatroides punctulatus*, Brullé, and *Zophosis punctata*, Brullé, infesting newly-planted tobacco seedlings; *Longitarsus parvulus*, Payk., and *Aphthona euphorbiae*, Schr., injuring young flax; *Phyllotreta corrugata*, Rche., infesting

stocks, wallflowers, etc.; *Ceroplastes rusci*, L., on fig trees; and *Tribolium confusum*, Duv., *Silvanus surinamensis*, L., *Tenebroides mauritanicus*, L., *Calandra granaria*, L., *Bruchus* sp., *Ephestia elutella*, Hb., etc., which caused injury to stored grain.

A new law has been drafted against *Syringopais* (*Nochelodes*) *temperatella*, Led., which provides for abstention from cereal growing for 2–4 years in areas decided on by the Director of Agriculture. It is also proposed to make compulsory the removal of all pods of carob [*Ceratonia siliqua*] infested by *Asphondylia gennadii*, Marchal, before 20th April, at which time this midge begins to leave the pods. From the beginning of March the infested pods may be distinguished by their small size and deformed appearance. The information concerning pests of olives has already been noticed [xviii, 461].

For the first time the anti-locust campaign was in charge of the Government Entomologist, and it was decided to carry it out by the purchase method employed in 1927 and 1928 [*cf.* xvii, 602], in order to observe the efficiency of this method with a view to the adoption of improved ones later on if they appear desirable. The most important species of locust in Cyprus is *Dociostaurus maroccanus*, Thnb. (Maroccan locust), and the next in importance is *Calliptamus italicus*, L. (Italian locust). The Tettigoniids present include *Tettigonia viridissima*, L., *Decticus albifrons*, F., and *Metrioptera intermedia*, Serv. Spraying with sodium arsenite and molasses was carried out in one area, and experiments were also undertaken with baits of bran, molasses and sodium arsenite. The spraying method appears to be very slow if the vegetation is to be thoroughly covered by means of knapsack sprayers. The bran bait can be applied much more rapidly and is much less dangerous to grazing animals. It is therefore proposed to use this method over an extensive area in the next campaign. Flame throwers were also tested, but as these instruments are most effective against dense swarms of winged adults, and no such swarms were formed during the year, their value is doubtful except in the possible event of an invasion of winged swarms of *Schistocerca gregaria*, Forsk., from Syria and Palestine [*cf.* xvii, 602].

PELAGHIAS (C. G.). **Investigations into the Locust Plague in Cyprus.**—*Bull. Dept. Agric. Cyprus*, Ent. Ser. no. 1, 21 pp., refs. [Corrigenda, 1 p.] Nicosia, 1929. [Recd. November 1930.]

This paper is a reprint of one already noticed from another source [*R.A.E.*, A, xvii, 602], but in view of recent work on the identity of the various species of locusts and grasshoppers of importance in Cyprus, an extra page has been published to correct and supplement the previous information on this subject. In addition to the locusts and grasshoppers noticed in the preceding paper, the Acridids, *Thisoecetrus littoralis*, Ramb., *Oedipoda miniata*, Pall., *Aiolopus strepens*, Latr., *Pyrgomorpha conica*, Ol., *Acrida turrita*, L., *Platypterna pruinosa*, Brunn., and *Anacridium aegyptium*, L., occur abundantly.

ISAAKIDES (C. A.). **Hellenic Republic: Locust Control.**—*Int. Bull. Plant Prot.*, iv, no. 8, pp. 113–115. Rome, August 1930.

In Greece, *Calliptamus italicus*, L., and *Dociostaurus maroccanus*, Thnb., have become increasingly abundant in recent years. In the

warmer parts of the plains hatching begins in March, and in the mountainous regions, whence the locusts descend to the plains, it continues till July. They mainly attack the summer crops, such as tobacco, vegetables, vines, fruit trees (particularly figs), olives and forest trees.

Control measures consist of catching the locusts in nets, burning them by means of flame throwers, spraying with mineral oil or arsenicals, and the use of poison baits. The baits were prepared according to the Vayssière formula (100 parts of bran, 50 of water, 14 of molasses, 5 of sodium arsenite and 5 of salt), but in some Departments it was found that decreasing the bran to 10 parts and increasing the molasses to 28 gave better results. In 1929, from 75 to 95 per cent. of the locusts were destroyed in various Departments as the result of control measures.

DI CAIRANO (V.). **Tripolitania: Locust Invasion and Control.**—*Int. Bull. Plant Prot.*, iv, no. 8, pp. 115–117. Rome, August 1930.

After an absence of more than 20 years from Tripolitania, locusts (*Schistocerca gregaria*, Forsk.) appeared in the coastal zone in November 1929; further swarms continued to arrive till the end of March 1930, and at times an area of nearly 250 acres was infested. Oviposition, which took place mainly in the strip of land separating the dunes and the steppe, began on 9th February and continued well into March. The adults were destroyed by means of straw and petrol fires. The hoppers were at first dealt with by sprays of 2·3 per cent. sodium arsenite, and then by means of baits of bran containing 5 per cent. sodium arsenite. The latter method was successful where natural food was scarce, but where green vegetation was abundant, spraying was found necessary.

ST. CLAIR (A. H.). **Report on Locust Research and Observation in Turkana, Kenya Colony, during August, September and October 1930.**—9 pp., typescript, 1 map. Nairobi, Kenya Dept. Agric., 1930.

Turkana, an area of about 32,000 square miles in the north-western corner of Kenya Colony, which is suspected of being one of the breeding areas of *Schistocera gregaria*, Forsk., consists mostly of semi-desert land covered with scrub bush and intersected by dry water-courses. According to the natives, locusts make their appearance there every year.

Large numbers of the tree locust, *Anacridium moestum*, Serv., and scattered individuals of *S. gregaria* ph. *solitaria* (*flaviventris*, Burm.) were found all over the country. The latter species was very numerous in Kukuma in an area about 20 miles broad over which a heavy thunderstorm had just passed, whereas it appeared to be absent in the dry area for 10 or 20 miles round.

The climatic conditions of Turkana are apparently suitable for bringing about the transformation of the solitary phase of *S. gregaria* into the gregarious one. The rainfall averages only about 3 inches a year and invariably comes in the form of very local thunderstorms. It has been observed that the solitary locusts have a tendency to concentrate in areas where rain has fallen, and a series of storms,

causing such concentrations, may lead to the gradual transition from the solitary to the gregarious phase.

The fact that all the females found in the Kukuma rain area were gravid, whilst in other parts of the district the periodicity of sexual maturation seemed to vary considerably, suggests that when there is a concentration of locusts in an area, there is a tendency among them to breed simultaneously, by which means transition into the gregarious phase is further promoted.

ROOKE (H. G. D.). **Note on Locusts in 'Iraq and the Control Measures adopted.**—*Mem. Dept. Agric. 'Iraq*, no. 13, iv+13 pp., 15 figs., 1 map. Baghdad, 1930.

Outbreaks of *Dociostaurus maroccanus*, Thnb., have occurred annually in Iraq since 1920, but are mainly confined to the northern provinces. In 1925, 70 per cent. of the crops of wheat and barley in the Mosul and Arbil Provinces was destroyed. The hoppers normally hatch in March, and the five larval stages occupy about 42 days. Migrations begin in the second stage. Oviposition takes place from mid-May till the end of June, and by mid-July most of the locusts have died, the eggs remaining in the ground till the next spring. The eggs are destroyed by jerboas and by larvae of the Clerid, *Trichodes laminatus*, Chevr., and the Bombyliid, *Thyridanthrax* sp., and both eggs and hoppers are eaten by various birds.

An account is given of the Locust Department, which was formed in 1924, and of the control work carried out by it. Experiments were made with poison baits prepared with sodium arsenite, sodium fluoride and Paris green, and 100 per cent. mortality was obtained with a bait consisting of 1 lb. sodium arsenite, 2 lb. molasses and 15 lb. bran, 90 lb. moistened with about 6 gals. water being sufficient for a line of second stage hoppers 100 yards long and 4 yards deep. The bait, however, is not taken by hoppers of the first stage. Poisoned horse dung and damped poisoned locusts also form excellent baits, dried fresh manure being much more effective than that which has been stored for some time.

As a result of the recommendations of the Chief Locust Officer of the Union of South Africa, experiments were made during the 1929 campaign with the South African system of spraying the vegetation with a solution of sodium arsenite (3 oz. to 4 gals. water). Hand sprayers or, where possible, lorries fitted with tanks and spraying apparatus were used, and in sprayed areas the mortality of hoppers was 100 per cent. during the first seven days after hatching. After the first twelve days, it decreased to 60 per cent., and then to 20, as the hoppers grew older.

Spraying with fuel oil is much slower than spraying with poison solution, or baiting, for a party of men spreading bait can deal effectively with ten times the area that could be dealt with in the same time by fuel oil. Aeroplanes have proved of great use for scouting purposes and for controlling the work in desert areas.

In 1928, 1929 and 1930, Iraq was also invaded by swarms of *Schistocerca gregaria*, Forsk., coming from the territory of Kuweit (Arabia). This species bred in Iraq, but climatic conditions were unfavourable for the development of the progeny, which suffered heavy mortality. Those individuals that reached the adult stage migrated northward.

Chen (K. Z.). **A preliminary Report on the Investigation of Locust (*Locusta migratoria* L.) in China (1929).** [*In Chinese.*]—*Tech. Bull. Bur. Ent. Kiangsu Prov.*, no. 8, 43 pp., 2 maps, 1 fldg. chart. Nanking, October 1930. (With a Summary in English.)

According to reports received from 12 Provinces, *Locusta migratoria*, L., infested in 1929 an area of more than 90,000 sq. miles on the shores of the Yellow Sea and the Gulf of Chihli and in the lower valleys of the Yellow, Yangtsze and Hwai Rivers. The damage done to crops, such as reeds (*Phragmites communis*) and all kinds of cereals, ranged from 10 to 90 per cent.

Marchal (P.) & Foex (E.). **Rapport phytopathologique pour l'année 1929.**—*Ann. Epiphyties*, xv, no. 6, pp. 317–373, refs. Paris, 1st August 1930.

This report includes a review of recent work on insecticides and notes on a number of insect pests occurring in France during 1929, with references to the papers published on the various subjects dealt with.

Rapports sommaires sur les travaux accomplis dans les laboratoires en 1929.—*Ann. Epiphyties*, xv, no. 6, pp. 374–403, refs. Paris, 1st August 1930.

In the campaign against the Colorado potato beetle [*Leptinotarsa decemlineata*, Say] in the Bordeaux region, described by J. Feytaud, the following insect enemies have been received from the United States: the Carabid, *Lebia grandis*, Hentz, the Pentatomids, *Perillus bioculatus*, F., and *Podisus maculiventris*, Say, and the Tachinids, *Doryphorophaga aberrans*, Towns., and *D. doryphorae*, Riley. These are being reared at the Bordeaux Entomological Station.

Observations made at Saint-Genis-Laval and described by A. Paillot showed that *Anuraphis amygdali*, Buckt., generally descended to the roots of peach trees during the summer; in winter the Aphids are found both on the roots and the aerial parts, and when the buds begin to develop, ants transfer them from the roots to the branches.

Balachowsky (A.). **La tordeuse orientale du pêcher (*Laspeyresia molesta* Busck) dans le midi de la France. Importance économique et mesures de protection.**—*C.R. Acad. Agric. Fr.*, xvi, no. 25, pp. 848–854, 1 ref. Paris, 1930.

Cydia (*Laspeyresia*) *molesta*, Busck, which was first observed in France in 1922 [*R.A.E.*, A, xi, 44], has gradually invaded all the peach orchards of the Alpes-Maritimes and most of those in Var. In 1929 a study of its bionomics was undertaken. In the Alpes-Maritimes the first adults emerge from the overwintered cocoons at the end of March, and in the coastal zone there are 6 or 7 generations a year. The female lays 100–200 eggs, singly, on the lower surface of very young leaves. Hatching occurs in 4–6 days, and the young larvae tunnel into the tender twigs, causing the young terminal leaves to blacken and dry up. A shoot never harbours more than one caterpillar, which may attack several shoots in succession. Although this

injury is of little importance in the case of older trees, repeated attacks frequently hinder the growth of young ones. The first and second generations infest the twigs exclusively, but the third generation, which appears in July, and following ones also attack the fruit. Early peaches picked before 15th July are rarely attacked; after this date, the later the variety the more heavily it is infested, as much as 50–90 per cent. of the crop being damaged. The fruit is generally attacked when it is fully developed, the entrance hole being, as a rule, on a level with the peduncle. The caterpillar may attack several fruits in succession. Pupation takes place in rubbish on the soil or in cracks in the bark. In the Alpes-Maritimes, young almond trees are equally infested, but no larvae have ever been observed in the almonds.

The difficulty of controlling *C. molesta* is pointed out [*R.A.E.*, A, xv, 188, etc.]. No reduction in infestation was observed in orchards regularly sprayed with nicotine against Aphids. Although parasites are numerous in this locality, they are of little value, for, even under the most favourable conditions, only about 3 per cent. of the larvae are parasitised. On the other hand, as few fruits are attacked before the middle of July, it is recommended that early maturing varieties only should be grown, and a list of these is given. It is suggested that quarantine measures should be drawn up to prevent the further spread of the insect.

WEBER (G. A.). **The Plant Quarantine and Control Administration. Its History, Activities and Organization.**—*Service Monog. U.S. Govt.*, no. 59, x+198 pp. Washington [D.C.], The Brookings Institution, 1930. Price $1.50.

This is another of the series of monographs describing the history, organisation and functions of various Government Departments in the United States [*cf. R.A.E.*, A, xviii, 507].

Until 1912 the United States was the only great country that was not protected by law from the importation of insect pests, in spite of the fact that in that year imported insect pests and plant diseases were estimated to be causing a loss in farm products of some £200,000,000 annually. Since that date an elaborate quarantine service has been built up, the history and organisation of which are here fully described, the expenditure under this head for 1929 exceeding £800,000. Appendices include a summary of the quarantine laws that have been enacted and a useful bibliography.

DAVIS (J. J.). **Insects of Indiana for 1929.**—*Proc. Indiana Acad. Sci.*, xxxix, pp. 291–303, 3 figs. Indianapolis, Ind., 1930.

Brief notes are given on a considerable number of insect pests recorded in Indiana in 1929.

YOTHERS (W. W.) & MASON (A. C.). **The Citrus Rust Mite and its Control.**—*Tech. Bull. U.S. Dept. Agric.*, no. 176, 56 pp., 1 pl., 10 figs., 21 refs. Washington, D.C., May 1930.

The following is largely taken from the authors' summary: The rust mite, *Phyllocoptes oleivorus*, Ashm. [*cf. R.A.E.*, A, xii, 94] is probably the third most important pest of *Citrus* in Florida, the

injury caused only being exceeded by that due to *Lepidosaphes beckii*, Newm. (purple scale) and *Dialeurodes citri*, R. & H. (citrus white fly). It is present throughout the citrus belt, and probably occurs on every tree in the State; on an average more than 50 per cent. of the fruit is injured. It is found on all the commercial species and varieties of *Citrus* grown in Florida, being most abundant on lemon and more numerous on grapefruit than on orange. A list is given of its food-plants, which include kumquats (*Fortunella* spp.) and *Citrus* and kumquat hybrids. The feeding of the mites results in the flattening or destruction of the outer layers of epidermal cells of the infested fruit, a form of injury that in the case of oranges is known as "russet," or in the case of severely injured grapefruit or lemon, when the epidermal cells are turned back and peeled off, as "shark skin." In many cases of severe infestation the growth is stunted and the fruit is practically all rind. The blemish known as "tear stain" is also known to be the result of mite injury. The keeping quality of the fruit is impaired, and, contrary to the somewhat prevalent idea, the russeted fruit is not so sweet as the uninjured fruit. The leaves and branches are also damaged by the feeding of the mites.

Studies on the life-history of individual mites were made possible by confining them under a gelatine capsule fixed to the rind of the fruit with paraffin wax. The incubation period and the larval stage both lasted 2–4 days in the hot months and 8 or more days in winter. The longest life period recorded for an adult was 23 days, and the maximum number of eggs deposited by a single female was 29. No male has been observed. The rapid increase of the mite may be due more to the fact that in summer a generation may be completed in 7 days than to a large reproductive capacity in the individual. The mites are continuously present in the trees throughout the year. The numbers reach injurious proportions about the middle of June and, apparently owing to infestation by a fungus, suddenly decrease a short time before the beginning of the summer rains. They are probably distributed on nursery stock, by insects and birds, and by wind. The period of maximum infestation occurs first on lemon, then on grapefruit, and about one month later on orange.

The abundance of the mites is reduced by frost and dry seasons. Hot sunshine and rains only drive them to the more protected surfaces of the fruit and leaves. Insect enemies are unimportant, but a fungous disease seems to be responsible for the almost complete disappearance of the mites, usually in the first half of July. They are never abundant in the more humid localities near the coast.

Tobacco, nicotine dust and oil sprays have not given sufficient control to prove profitable. Sulphur, which has been found the most satisfactory material, reacts through the fumes from its oxidation and does not require to be in actual contact with the mites. Sprays and dusts appear to be equally effective when compared on the basis of the sulphur content. When used in the form of a lime-sulphur solution at a dilution of from 1 : 50 to 1 : 100, it should kill all adults and larvae present at the time of application and remain effective under any weather conditions for a sufficient time to kill all larvae subsequently emerging from eggs laid prior to spraying. Dusting with sulphur or with sulphur and lime mixtures is also effective and may be carried on at any time of the day, though the dust will remain on the trees longer if applied when the foliage is wet with dew. If the percentage of lime in a mixture is much more than 20, results are not so satis-

factory, the lime itself not being toxic to the mites. If a drenching rain falls within four days, it may be necessary to repeat the dusting before the eighth day after the first application. Sulphur should be applied when the mites are reasonably numerous on the fruit, but before a sign of russeting has appeared.

Johnson (D. E.). **The Relation of the Cabbage Maggot and other Insects to the Spread and Development of Soft Rot of Cruciferae.**—*Phytopathology*, xx, no. 11, pp. 857–872, 1 fig., 17 refs. Lancaster, Pa., November 1930.

The experiments described were conducted in Minnesota to determine whether *Phorbia* (*Hylemyia*) *brassicae*, Bch., is responsible for the spread of *Bacillus carotovorus*, which causes bacterial soft rot in cabbages.

The following is largely taken from the author's summary. The eggs of the fly were found to be free from bacteria internally, but were contaminated externally with bacteria of various kinds, often including soft rot organisms. They probably become contaminated from the body of the parent fly, the soil, or decaying vegetable matter. The larvae that hatched from surface-sterilised eggs contained no bacteria. They apparently become contaminated externally, however, from the soil, decaying plant material, and probably the contaminated eggshell, and ingest bacteria with their food. The puparia contained viable bacteria of many types, including those producing soft rot. Such bacteria were also found in viable form in the intestinal tracts and the excrement of the adults. Soft rot bacteria were found in over-wintering puparia and were viable in puparia exposed to freezing temperatures. There is evidently a close association between the soft rot bacteria and the fly throughout its entire cycle. Larvae fed on decaying cabbage tissue inoculated fresh cabbage leaves with soft rot bacteria, which reduced them to a rotten mass. The constant lacerations from the maggot prevented the wounded tissue from healing over and checking the decay.

Typical soft rot was also produced in cabbages when the latter were inoculated with macerated intestinal tracts of Cynipids parasitic on *P. brassicae*. In 1928, out of 494 puparia of the spring brood of the fly, 94 per cent. were found to be parasitised by Staphylinids, most of which were *Baryodma bimaculata*, Grav. Inoculations of the macerated gastric tract of some of these insects produced soft rot in cabbage. Adult Staphylinids emerging from puparia of the fly were often found to harbour the soft rot bacteria. Collembola feeding on rotting cabbage were transferred to healthy cabbage seedlings, and decay followed their attack upon the plants.

Preliminary tests indicate that *Hylemyia antiqua*, Mg. (onion maggot) is a factor in the development of soft rot of onion caused by *B. carotovorus*.

Fellows (H.). **Wheat Take-all Symptoms compared with Injuries caused by Chinch Bugs.**—*Phytopathology*, xx, no. 11, pp. 907–909, 2 figs., 2 refs. Lancaster, Pa., November 1930.

It is sometimes difficult to distinguish the injuries caused to wheat in the United States by the fungus, *Ophiobolus graminis*, and the Lygaeid, *Blissus leucopterus*, Say (chinch bug), especially when both

are present in the same field. The methods used for studying the respective types of injury are described. The similarity of the symptoms caused by the two pests is probably due to their somewhat similar action, being mostly in the general behaviour of the wheat plants attacked. Wilting, browning, and final death of the leaves occur in both cases. *B. leucopterus* feeds chiefly on the phloem in the leaf sheaths [*cf. R.A.E.*, A, xvi, 641]; the fungus disintegrates both the phloem and the conjunctive tissue, invading primary and secondary roots, subcoronal internode, crown, leaf sheath, and culm tissues. Both the fungus and the bug occur in patches in the field, but the latter is gregarious and apparently prefers to feed in more or less open spots, where stands are thin, whereas areas infested by the fungus may, and often do, occur in the interior parts of fields with very heavy stands. Furthermore, along the edges of an area infested by the fungus, there is a sudden transition from the short diseased plants of the infested patch to the surrounding healthy ones. Chinch bugs cause a more gradual transition at the margins of infested patches. For a more reliable determination entire individual plants should be examined. Wheat plants attacked by the bugs have a good root system and tiller well. Discolouration may occur at the bases of the culms in the advanced stage of the injury, but is of a brown tinge. The fungus invades the crown, hinders the formation of the roots, and causes those that are formed to be black and brittle. The bases of the culms become black and shiny. Often there is also a mycelial plate on the surface of the lower culm.

Gilmer (P. M.). **Results of the 1928 Experiments in the Arkansas Valley on Codling Moth Control.**—*Bienn. Rep. Kansas Hort. Soc. 1928–29*, xl, pp. 31–37.
Ackerman (A. J.). **The Codling-moth Situation.**—*T.c.*, pp. 38–41.
Gilmer (P. M.). **Spraying for Codling Moth.**—*T.c.*, pp. 41–45. Topeka, Kans., 1930.

Experiments for determining the best dates and methods of applying sprays for the codling moth [*Cydia pomonella*, L.] are described. Various spray formulae were tested, but oil, against the second brood, was the only material that showed any promise as a substitute for lead arsenate.

Pickett (W. F.) & Swarthwout (H. G.). **Proper Use of Spray Equipment.**—*Bienn. Rep. Kansas Hort. Soc. 1928–29*, xl, pp. 48–51.
Pickett (W. F.). **Orchard Spraying.**—*T.c.*, pp. 51–53.
Lewis (D. E.). **The Stationary Spray Plant.**—*T.c.*, pp. 53–61. Topeka, Kans., 1930.

The selection of spraying equipment and the method of its use are discussed. A trial has been made in Missouri with a stationary spray plant, which has proved very successful.

Dean (G. A.). **Insects injurious to small Fruits.**—*Bienn. Rep. Kansas Hort. Soc. 1928–29*, xl, pp. 137–155. Topeka, Kans., 1930.

A short account is given of the appearance, life-history and methods of control of the following pests of small fruits in Kansas and Missouri: On vines, *Fidia viticida*, Walsh (grape rootworm), *Polychrosis*

viteana, Clem. (grape berry moth), *Erythroneura comes*, Say (grape leafhopper), *Macrodactylus subspinosus*, F. (rose chafer), *Haltica chalybea*, Ill. (grape flea beetle), *Desmia funeralis*, Hb. (grape leaf-folder), *Alypia octomaculata*, F. (eight-spotted forester), and *Amphicerus bicaudatus*, Say (grape cane borer); on strawberry, in addition to those recorded elsewhere [*R.A.E.*, A, xvii, 221], *Empria fragariae*, Roh. (strawberry sawfly), and *Harpalus* spp. (ground beetles), which sometimes attack the ripening berries, though they are usually predacious on other insects; on currants and gooseberries, *Pteronus* (*Pteronidea*) *ribesii*, Scop. (imported currant sawfly), *Capitophorus* (*Myzus*) *ribis*, L. (currant aphis), *Aegeria* (*Sesia*) *tipuliformis*, Cl. (imported currant borer) and various Coccids; on raspberries and blackberries, which are not, as a rule, seriously injured, *Pennisetia* (*Bembecia*) *marginata*, Harr. (raspberry root borer), *Oberea bimaculata*, Ol. (raspberry cane borer), *Agrilus ruficollis*, F. (red-necked cane borer), *Aulacaspis rosae*, Bch. (rose scale), *Oecanthus nigricornis*, Wlk. (striped tree cricket), *Monophadnus* (*Monophadnoides*) *rubi*, Harr. (raspberry sawfly), *Byturus unicolor*, Say (raspberry fruit worm) and *Tetranychus telarius*, L. (red spider).

Spray schedules are given for each of these fruits.

Burke (H. E.). **Which Insects are the important Enemies of Shade, Park and Ornamental Trees in the Pacific States?**—*J. Econ. Ent.*, xxiii, no. 5, pp. 783–785. Geneva, N.Y., October 1930.

A list in order of importance is given of 50 pests of these trees in the western United States, half of which appear to be introduced species. Although the list gives a good general idea of the relative importance of the pests, taking the area as a whole and the period of time as the past 20 years, it does not hold good for any one area or at any one time, since climatic or other conditions are liable to increase unexpectedly the importance of a little-known native pest, or a new one may be imported at any time. Thus in 1930 more enquiries have been received in one part of California concerning two small larvae defoliating cypress than about any of the species included in the list. One of these is *Argyresthia franciscella*, Busck, and the other, a leaf-tier, appears to be unrecognised.

Scullen (H. A.). **Notes on the Distribution and Altitude Range of Oregon Bremidae (Hymenoptera).**—*J. Econ. Ent.*, xxiii, no. 5, pp. 786–789, 2 refs. Geneva, N.Y., October 1930.

A list is given of 22 species and 15 varieties of *Bombus* (*Bremus*) and 4 species and 1 variety of *Psithyrus* occurring in Oregon, where bumble-bees range from sea level to the snow line and are common everywhere except in the arid uncultivated sections. Several species, particularly *B. californicus*, Smith, are of considerable value in the pollination of red clover.

Childs (L.) & Gillespie (D. G.). **Notes on the Introduction of the Woolly Apple Aphis Parasite,** *Aphelinus mali*.—*J. Econ. Ent.*, xxiii, no. 5, pp. 790–794, 4 refs. Geneva, N.Y., October 1930.

In view of the importance of suppressing *Eriosoma lanigerum*, Hausm., owing to its relation with *Gloeosporium perennans* [*R.A.E.*, A,

xvii, 666 ; xviii, 342], work with *Aphelinus mali*, Hald., was started in 1928. This parasite was not found in any of the major apple districts of the Pacific coast of North America, except in limited areas at Vancouver, B.C., where liberations had been made in 1922. It was introduced from Michigan into the Hood River Valley (Oregon) in August 1928, and other material was received from the same area in 1929. It successfully passed two winters in the field and became thoroughly established at a number of points as the result of liberations made during the summer of 1929, when seven generations occurred. In 1930, adult parasites were first observed on the trees in the orchard on 20th April, the date on which the Aphids were first seen to be active. Although the previous failure of *A. mali* to become established naturally on the Pacific Coast would indicate the possible operation of some unfavourable ecological factor in that region, the ease with which it has been colonised there suggests that it may eventually become effective in the control of *E. lanigerum*.

CHAMBERLIN (W. J.). **Entomology and Engineers.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 795–798. Geneva, N.Y., October 1930.

In connection with a course now being offered to engineers at Oregon State College, notes are given on the importance of the injury caused by insects to timber and timber products, telephone sheathing, etc., which is estimated to involve an annual loss of at least £10,000,000 in the United States.

SPULER (A.). **Codling Moth Activity in the Wenatchee Valley as shown by Trap Records.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 803–809, 1 pl., 3 figs., 1 ref. Geneva, N.Y., October 1930.

Moth trap records taken in various orchards in the same and different localities in Washington State during the past four years show that bait traps are efficient indicators of the activities of the codling moth [*Cydia pomonella*, L.]. It is concluded from these records that, contrary to previous supposition, the individual conditions prevailing in each orchard did not in any way influence the emergence and oviposition of the moth, which showed a marked similarity in all parts regardless of variations in temperature, and were apparently unaffected by such factors as soil, cultural practices, cover crops or exposure. Thus information regarding the time when the young larvae are likely to begin entering the fruit can be secured at a selected centre in any district, though the relative abundance of moths will vary in each particular orchard according to the degree of infestation in the previous year and the thoroughness with which sprays are applied. Moth trap records do not give information on the actual date of emergence of *C. pomonella*, as the moths may remain inactive if the weather is unfavourable for flight and may not be caught in the traps until some time after emergence. Oviposition may be delayed by unfavourable weather, and relatively few eggs may be laid even when many moths have emerged.

A study of temperature records in four orchards where bait trap tests were conducted in 1927 and 1928, each of which presented a combination of conditions different from the other three, shows that although there were considerable differences in maximum and mean daily temperatures, those registered at 8 p.m. during May and June

fluctuate above and below 60° F. at approximately the same time. Whereas it has been hitherto supposed that under favourable temperature conditions moth emergence in spring would be rapid and cover a relatively short period of time, these records show that the moth catch in the warmest orchard extended over the longest period. A comparison of the results secured during July, August and September showed the same fluctuations in the four orchards throughout the season, apparently regardless of evening temperatures.

With a view to determining the length of time taken for all the moths to emerge from cocoons in a cage, one was erected in 1929 around the trunk of a living tree and stocked with about 1,400 larvae, all of which were taken from tree bands within a period of two weeks. The larvae were allowed to enter the soil or to hibernate under the bark of the trunk. Moths began to emerge on 30th April 1930 and were still emerging at the rate of 15–20 a day on 15th June, by which date a total of 300 had emerged. As the result of exceptionally low temperatures during the winter (–19° F.), mortality had been rather high among the hibernating larvae. Emergence had thus covered a period of nearly two months and was likely to continue for some time longer. Trap records are considered more valuable than caging larvae, since they are based on actual flight and oviposition under natural conditions in the orchard.

SHERMAN (F.). **Results of Airplane Dusting in the Control of Cotton Boll Worm** (*Heliothis obsoleta* **Fab.**).—*J. Econ. Ent.*, xxiii, no. 5, pp. 810–811, 1 fig. Geneva, N.Y., October 1930.

The following is largely taken from the author's abstract: Large scale aeroplane dusting operations near College Station, Texas, in 1927 indicated that the boll weevil [*Anthonomus grandis*, Boh.] might be successfully controlled on cotton by the use of 5–6 lb. calcium arsenate to the acre [*cf. R.A.E.*, A, xvii, 522]. *Heliothis obsoleta*, F., however, was not controlled, and it increased on the dusted area throughout the season as well as on plots treated from the ground with 12 lb. calcium arsenate per acre. General observations indicated that more damage by this bollworm occurred on heavily dusted cotton than on untreated areas [*cf. R.A.E.*, A, xviii, 64].

FROST (S. W.). **Some Factors affecting the Infestation of Oriental Fruit Moth.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 813–821, 1 fig. Geneva, N.Y., October 1930.

An attempt was made in Pennsylvania during the summer of 1929 to determine the influence of a number of factors bearing upon infestation by *Cydia* (*Laspeyresia*) *molesta*, Busck, where several varieties of peach are grown together. An orchard of 10,000 bearing trees was selected where different varieties, including both young and old trees, were growing together. Twig infestation was determined by clipping all infested terminals about once a week from the same five trees near the middle of each variety. It lasted from 28th May until 15th August, was generally greatest on the youngest trees, and reached its maximum about 10th June. Collections of 100 fruits taken once a fortnight from trees near the centre of each variety were made from 10th June till 30th July. These were placed in jars with strips of corrugated paper and covers of cheesecloth,

daily records being made of the larvae, pupae and adults found in the jars. Records were also made of infestation by curculio [*Conotrachelus nenuphar*, Hbst.], which was most severe on a few trees adjacent to a brush pile where conditions were favourable for its development. In order to determine the distribution and abundance of the moths, bait traps were placed near the centre of each variety under observation, replenished 4 times during the season and examined once a week. It was found that during the early summer the moths were flying among the old trees on the north side of the orchard, in which the larvae had probably hibernated, and during the late summer among the young trees towards the south.

Although the data obtained do not admit of general conclusions, it appears certain that during the early part of the season succulent and thrifty twigs are attractive to the larvae, which migrate to the fruit as it ripens and the twigs harden. Larvae of the first brood were occasionally found to enter small green fruit in preference to twigs where the latter were not making normal growth. On the other hand very rapid growth may force the larvae from the twigs or even kill them. The increase in number of moths due to new broods during the summer is evident when studying twig infestation, fruit infestation and bait traps, and the duration of each brood can be determined almost as readily by these studies as by rearing methods.

Considerable fluctuations noted from year to year on a given variety of peach are probably due to seasonal conditions, which influence not only initial infestation and broods but also set of fruit and growth of twigs and fruit. Injury to one variety was 18–26 per cent. in 1926, 80–83 in 1927, 13–18 in 1928, and 25½ in 1929.

Moody (D. L.) & Mills (H. B.). **Biological Notes on Aphids affecting Apples with special Reference to Vitality of Eggs (Aphididae, Homoptera).**—*J. Econ. Ent.*, xxiii, no. 5, pp. 822–825, 5 refs. Geneva, N.Y., October 1930.

Biological notes taken during the autumn in 1928 and 1929 are given in respect of Aphids attacking apple in Iowa, where no previous studies appear to have been made.

The following are the authors' summary and conclusions : After an early frost in October 1925, Aphids were very scarce in central Iowa until the autumn of 1928, when *Aphis pomi*, DeG., was found in small numbers and *Anuraphis roseus*, Bak., fairly abundantly. In the autumn of 1929, both species were quite abundant. In 1928, *A. roseus* was seen returning to apple in the first week of October. Both species continued oviposition until frost set in on 1st December. *A. roseus* was seen migrating to apple in small numbers on 12th October 1929. Observations on eggs of *Aphis pomi* indicate that the small hatching percentage of the eggs of both these Aphids in the spring might be due to lack of atmospheric humidity after oviposition in the autumn.

St. George (R. A.). **Drought-affected and injured Trees attractive to Bark Beetles.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 825–828. Geneva, N.Y., October 1930.

Records are given of a number of cases observed during 1929 in Michigan in which hickory infested by *Scolytus quadrispinosus*, Say,

and pines attacked by *Dendroctonus frontalis*, Zimm., *Ips calligraphus*, Germ., or *I. grandicollis*, Eichh., to such an extent that they were in a dying condition, were found to have been rendered attractive to the beetles by a condition produced by lack of precipitation or were near trees that had been injured by such agencies as wind or lightning.

Pearson (H. M.). **The Thrips Factor in Onion Sterility.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 829–831, 2 refs. Geneva, N.Y., October 1930.

Observations in California are recorded on *Thrips tabaci*, Lind., which indicate that the loss it causes to the onion seed industry is probably more extensive than has hitherto been realised. Sections of flower buds showed that thrips gain admittance to very young buds of onion, possibly forcing their way between the healthy perianth segments, but more probably between segments partly killed by early feeding. Within the buds, the thrips cause serious injury to the immature stamens and pistils. An attack may be followed by the death of all the anther contents and collapse of the anther cavity. Thrips frequently feed upon the styles and stigmas, probably rendering the latter partly or entirely unreceptive, depending on the age at which they are attacked and the severity of the attack. Direct injury may perhaps be caused to the young ovaries, but not to the thick-walled older ones or to the mature anthers. Apart from direct injury to the essential organs, sterility may be caused by feeding on the flower pedicels. A reliable index of thrips infestation is the number of eggs laid in the flower, since the adults must have been feeding close by, but 2–3 eggs may be laid in a single flower without any obvious sterilising effects, particularly in the case of older buds. Thrips cannot seriously injure the developing ovules after fertilisation except by feeding on the flower pedicels.

A spray consisting of nicotine sulphate and fish oil soap is effective against *T. tabaci*, although scarcely practicable, and *Triphleps tristicolor*, White, preys upon it.

Ingram (J. W.) & Holloway (T. E.). **Injury to Sugarcane by a small Weevil.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 832–833, 1 ref. Geneva, N.Y., October 1930.

Anacentrus sp. is a small weevil the larva of which was recorded as making borings in old sugar-cane stubble in 1919, when it was determined as *Limnobaris* sp. [*R.A.E.*, A, viii, 79]. It was again observed in 1925 on an area of about 10 acres in Louisiana, causing injury by boring into the woody part of young plants just at the point where they leave the planted seed cane and killing them. In many cases, however, the cane sprouted again and the new shoots were not killed. Injury had ceased by 8th July when the plantation was visited. The adult, larva and pupa of this species, which is probably closely allied to *A. planiusculus*, Csy., are very briefly described. In the winter of 1929 and spring of 1930, injury by this weevil was observed in cane stubble in all the fields examined, damage being heavier in second-year than in first-year stubble and rare in plant cane. In some cases the stubble was riddled with tunnels, and all eyes were killed by the larvae or by the entry of disease organisms into the tunnels. Eyes were

often found that the larva had hollowed out, thus forming a chamber in which it pupated. The adult weevils appeared to be most numerous in soil surrounding cane stubble in August and September when the eggs were evidently laid in the stubble. The first pupa was found on 20th January and the first newly emerged adult on 10th February. Larvae occurred in the cane stubble throughout the winter and as late as 11th June. About 54 per cent. of the eyes were dead among cane in the first-year stubble examined in April. Of this percentage 13 per cent. had been killed directly by the larvae.

BACK (E. A.) & COTTON (R. T.). **Insect Pests of upholstered Furniture.** —*J. Econ. Ent.*, xxiii, no. 5, pp. 833–837, 11 refs. Geneva, N.Y., October 1930.

An account is given of the injury caused to upholstered furniture by *Tineola bisselliella*, Humm. (webbing clothes moth), *Tinea pellionella*, L. (case-making clothes moth) and *Anthrenus vorax*, Csy. (furniture carpet beetle), which in Washington, D.C., has recently become a most serious pest of furniture upholstered in hair and feathers, and also feeds on wool in the covers [*cf. R.A.E.*, A, xvi, 202]. *Attagenus piceus*, Ol. (black carpet beetle) and *Anthrenus scrophulariae*, L. (common carpet beetle) are also found in furniture in small numbers. *Lasioderma serricorne*, F. (tobacco beetle) is an important pest of furniture upholstered in flax tow or straw. Although the authors cannot indicate any region as more subject than others to attack by *L. serricorne*, some firms avoid the use of flax tow in furniture to be sold in areas where complaints have indicated that conditions are particularly favourable to the multiplication of the beetle, among these being certain regions in the Ohio and Mississippi valleys. The larvae feed directly upon the straw and only eat the covers when unable to make their exit by other means. Vegetable upholstery materials are also infested by *Sitodrepa panicea*, L., and Psocids, which breed in furniture in large numbers and crawl over the covers and woodwork without harming it.

FLANDERS (S. E.). **Recent Developments in *Trichogramma* Production.** —*J. Econ. Ent.*, xxiii, no. 5, pp. 837–841, 1 pl., 2 refs. Geneva, N.Y., October 1930.

Production of *Trichogramma* [*minutum*, Riley] was begun on a commercial scale during the spring and summer of 1930 in Orange County, California, where a temperate and humid climate is favourable to *Sitotroga cerealella*, Ol., the laboratory host of the parasite. Types of equipment which constitute an improvement on that previously noticed [*R.A.E.*, A, xvii, 455] are described. Three rooms were fitted up for moth production, one for egg deposition and one for parasite propagation. Each moth room contains a set of 20 wooden trays, 9 ft. long, 30 ins. wide and 5 ins. deep, filled with 8,500 lb. common white maize, the total cost of one unit, exclusive of maize, being about £40. Each unit consists of two parallel stacks of trays, 26 ins. apart, the outer sides of the bottom trays resting on the floor, the inner sides on two parallel 2-inch planks each 12 ins. wide and 9 ft. long, set up edgewise. These planks are held in position by two shorter

pieces, 26 ins. long, one at each end. The inner side of each tray is $\frac{1}{8}$ in. lower than the other three sides in order to allow of emergence of the moths from the trays. The outer side of each tray is $\frac{1}{4}$ in. above the bottom of the tray, and the opening thus formed is faced on the inner side with a 30-mesh screen. Air can therefore be forced through the crevice at the upper side, down through the grain and out of the crevice on the lower side. The covers placed on the top trays of each stack are sufficiently wide to meet over the space between the stacks and form a solid roof, and the enclosure is completed by long-cloth tacked and pasted over the ends. A cloth door, 2 ft. by 3 ft., is constructed at one end and an electric fan is placed in a circular cut in the cloth at the other, so that cool damp air can be blown in continuously. A piece of 1-inch pipe, 5 ft. long, placed on one side of the enclosure about 4 ins. from the floor extends from the centre through one of the end planks. A standard vacuum collecting hose is fastened to the inner end of this pipe, the end outside the enclosure serving as a connection to a portable moth trap. This trap consists of a cylindrical cage, 8 ins. by 20 ins., of 20-mesh brass screen with a removable cap on one end. The cage is housed in a cylinder of sheet iron, 10 ins. in diameter and 24 ins. in length, in the bottom of which is a $1\frac{1}{4}$-inch opening forming the inner end of a pipe 2 ins. long. The bottom is inset 3 ins. so that the housing can be set upright when assembling the trap. The housing is supplied with a cover projecting 2 ins. on either side and lined with a soft rubber pad, a $1\frac{1}{4}$-inch pipe passing through its centre. A coil of spring wire 3 ins. in height and 4 ins. in width is placed on the bottom of the housing. The cage, with cover removed, is set on this spring, and the housing cover is placed on top and forced down until it can be locked in position. The spring presses the mouth of the cage against the rubber pad so that the moths cannot escape. The cage is in a horizontal position when in use, an electric motor and suction fan being attached to the pipe at the bottom of the cage by flexible tubing, and a similar piece of tubing connecting the pipe on the housing cap to the outer end of the pipe leading into the moth enclosure. When enough moths are collected in this trap, it is set up on end, the cover unfastened and the cage vibrated on its spring to shake down the moths so that the cage cover can be replaced without losing any.

The cage containing the moths is then placed in another cylindrical housing, 10 ins. in diameter, 4 ft. in length and open at each end, for the deposition of eggs. The cage is held in the centre of the cylinder, which is horizontal, by two strips of sheet iron, 1 inch wide and 3 ins. apart, extending the whole length of the tube. An electric fan is placed at one end, and a baffle board and trough at the other to deflect the air current and concentrate the eggs deposited in the air current. The eggs are then cleaned and placed on egg cards (4 by 8 ins.) on which shellac has been stamped in small squares by means of a piece of wood grooved both across and lengthwise to form a series of raised blocks, the surface of which has been coated with the varnish. Eggs poured on to the card adhere on uniform squares, facilitating counting and the cutting of the card into small units for liberation.

An infestation of *Sitotroga* was built up for a month at a temperature of 80° F., in grain which was subsequently placed in the bins, where it was found necessary to reduce the heat of infestation by constantly circulating cool damp air through the grain, the optimum temperature for mass production being 85° F. Parasite production was interfered

with in April and May by the appearance of numbers of *Plodia interpunctella*, Hb., which were, however, entirely eliminated by the introduction of *Microbracon hebetor*, Say (*Habrobracon juglandis*, Ashm.) into the moth rooms. Before this was done, it was impossible to separate the two moths or their eggs, and the larvae from unparasitised *Plodia* eggs fed on the parasitised eggs and spun a dense webbing over the entire mass. Ten days after the filling of the first unit on 4th May the egg production amounted to 100,000 daily, and averaged 500,000 during June, July and August, after which production was practically stopped by *Habrocytus cerealellae*, Ashm., a parasite of *S. cerealella*, which appeared about the middle of the last month. The incubation period of this parasite, which also oviposits in the larva of the potato tuber moth [*Phthorimaea operculella*, Zell.], is less than 24 hours.

The cage used for obtaining parasitism, which will hold 2,000,000 parasites and is described in detail, is a wooden box with one side of glass so constructed that when in use no light can enter or parasites escape. Light entering a container from one direction apparently interferes somewhat with the oviposition of certain strains. Parasites begin to emerge 7–8 days after oviposition when the temperature is maintained at about 80° F. Emergence can be delayed for 9 days by placing the parasites in a constant temperature of 53° F. one day before they would otherwise emerge. For several weeks during July and August well over 1,000,000 parasites were produced daily, the total shipped for liberation in the field amounting to over 20,000,000 up to 1st September.

A simple type of unit for use in experimental work is also described.

FLANDERS (S. E.). **Evaluation of *Trichogramma* Liberations.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 886–887. Geneva, N.Y., October 1930.

In view of the fact that liberations of *Trichogramma* [*minutum*, Riley] against insect pests have not yet been definitely proved to be of practical value, a note is given on methods of determining their effectiveness. The author distinguishes between the accretive method of liberation used to accelerate the building up of the parasite population in field crops, and the inundative method employed against greenhouse and orchard pests, the effectiveness of the former being the more difficult to determine. In the case of the accretive method, liberations are made only when host eggs are present in sufficient numbers to permit a rapid increase in parasites, such conditions being brought about at isolated points by the use of baits or light traps. The extensive plant surface of field crops, affording unlimited cover for the insects, and the comparatively low value of the crops render the use of any other method impracticable. In cases suitable for the inundative method, on the other hand, the plant surface is less and the acreage value of the crop high. Here a small number of pests can do a great deal of damage, and injury by early generations is relatively great, so that reproduction of the host should be prevented by continuous liberations. In the control of the oriental peach moth [*Cydia molesta*, Busck] and codling moth [*C. pomonella*, L.], liberations must be made at intervals timed so that the parasite is always present in numbers greatly exceeding the host population. The length of the life-cycle of the parasite in the field must be ascertained. Since the oviposition of moths attacking fruit trees is more or less periodic and the amount of

oviposition comparatively low and scattered, the accretive method could rarely be used with success.

In determining the effectiveness of accretive liberations, it must be recognised that a low percentage of parasitism early in the season when the pest population is low may be more effective than a high percentage of parasitism when the pest population is high. Thus a 50 per cent. parasitism of 20 hosts is equal in actual results to a 90 per cent. parasitism of 100 hosts. The amount of parasitism is usually determined by observation of the ratio between the parasitised and unparasitised eggs in the field.

In determining the effectiveness of inundative liberations, a count of hatched eggs and vacated parasitised eggs should be made throughout the season. Some idea of the effect of each liberation can be obtained by correlating the amount of injured fruit at each inspection with the percentage of parasitism and total number of host eggs. Eggs that are counted should be rubbed off at the time of inspection.

In the case of field crops the relation of natural egg parasitism to the total egg parasitism can only be measured by having numerous uncolonised fields throughout a wide area to take in the extreme variations in natural parasitism. Should a colonised field over a number of years, or a number of colonised fields in a single season, consistently show a higher parasitism and greater reduction in crop injury than most of the uncolonised ones, the control may be considered to be due to liberations.

Smith (R. C.) & Barker (H. D.). **Observations on the "Yellows" Disease of Beans and related Plants in Haiti.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 842–847, 1 pl., 4 refs. Geneva, N.Y., October 1930.

A disease of beans and allied pulses resembling mosaic, but named a "yellows" disease, which limits the production of beans in Haiti (where they constitute one of the most important native foods) to a very short season except for localities at altitudes above 2,500 ft., has been found to be transmitted by *Empoasca fabalis*, De Long [*R.A.E.*, A, xviii, 494, 555]. Experiments carried out in 1929 indicated that the symptoms were not produced by other insects present on beans during the studies, but failed to determine whether they are due to a virus transmitted by the leafhopper or are a reaction from some fluid injected by it while feeding. Beans grown from the seed of plants seriously affected, if kept free from leafhoppers, produce normal plants at any season without signs of the disease, which was also not transmissible by ordinary inoculation. All varieties of beans are attacked, but marked differences occur in varietal susceptibility, ranging from complete susceptibility as evidenced by early death to a high degree of resistance with the production of a moderate crop. Spraying with Bordeaux mixture, 4–8–50, or nicotine sulphate, 1 teaspoonful to 1 U.S. gal. water, was unsuccessful as a control measure.

Woodworth (C. W.). **Petroleum Insecticides.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 848–851. Geneva, N.Y., October 1930.

The highly refined heavy oils that have recently come into prominence constitute new insecticides, strikingly different from kerosene, which was for a long time the standard, and almost the only, one of the petroleum class. A table is given indicating the chief characteristics

of the leading classes of insecticides, arranged according to their economic standing. It is suggested that the development is imminent of a large group of petroleum insecticides, including kerosene and heavy oils, with intermediate members different from both. There are at present on the market over 100 brands of heavy oils, which are distinguished by the control laboratories as :—miscible oils, made with cresol soap ; soap emulsions, made with ordinary soaps ; and non-soap emulsions, the most common emulsifier being calcium caseinate. The more important distinction, however, is according to the character of the oil employed, namely kerosenes with a gravity of 40° Bé., constituting probably not over 2 per cent. of the trade ; summer oils with a gravity of about 30° ; and crude and winter oils with a gravity in the neighbourhood of 20°. The crude oils consist of a mixture of oils having a wide range of gravity, whereas those sold as winter oils are distillates in which both the lighter and heavier fractions have been removed, and some of them approach the summer oils in both gravity and refinement. It is suggested that the terms thick and thin should be substituted for the manufacturers' classification of summer oils as heavy and light, as both may have the same gravity. A table is given showing the average physical characteristics of winter oil and of three grades of summer oils, but it is possible that none of the data by which it has hitherto been attempted to differentiate between these oils has any real significance in determining their efficiency as insecticides. The insecticidal effect of an oil depends on the very small quantity of the material that is absorbed by the blood after finding its way into the tracheae of the insect. This absorbable ingredient may be very small in amount, but it is the essential element, and it may be that all of the measured physical qualities merely indicate the character of the predominating non-absorbable, and therefore non-effective, portions of the oil, the menstrum in which the effective biolyte is dissolved. The amount of oil that penetrates a leaf is probably relatively much greater than that which enters an insect, and the effects on a plant are also much easier to study. The following is a tentative classification of the effects of oils on plants :

Mechanical effects, increasing with high viscosity and low evaporation, include softening of the bark and bud scales, changing the appearance of fruit with bloom, reduction of cuticular evaporation, giving protection from desiccating winds (after initial chemical effect is past), and possible excessive evaporation through the stomata after penetration of the walls of the guard cells.

Chemical effects, depending on the chemical ingredients of the oil, are grouped in three series :

Paraffins—Lower members of the series are more general poisons. The higher members are practically inactive and in the heavy spray oils now on the market constitute only the menstrum carrying the unsaturates of the following series.

Olefins aromatics—Many of the higher members are special drugs or poisons and much more active.

There is a very slow translocation even of the denser oils and consequently a slight physiological effect, but the nature of the more evident actions consists in : Firstly, modification of the action of certain enzymes : 1. Increasing hydrolysis, initial and local, evidenced by dropping of leaves and fruit ; afterward the general effect is growth stimulation, reduction of the quantity of fruit buds and early opening of buds in the spring (see also the first of the mechanical effects above).

2. Decreasing oxidation, thus delaying ripening of fruit, colouring of lemons and colouring of autumn leaves. Secondly, biolysis of the protoplasm, followed by excessive oxidation showing as browning of the leaves or parts of leaves or fruits, dying of tips of twigs, and death of spots on roots or bark. This class, with the common end points just enumerated above, can be subdivided according to preliminary symptoms indicating differences of the chemical action of the biolytes.

Hastening conditions include low viscosity permitting rapid penetration, high temperature producing low viscosity in the oil, dry condition of leaves permitting ready penetration, and quick breaking of the emulsion. Intensifying conditions include slow evaporation, giving a long time for penetration, low temperature, reducing the rate of evaporation, high concentration of the spray, and special susceptibility of the plant.

The terms biolysis and biolyte, probably new to entomological literature, are considered by the author likely to prove very useful in their various forms, biolyte being the general term for insecticides, fungicides, etc., biolysis for the killing of pests, and biolytology for the science of economic poisons. When studying the nature of biolytes, it will be commonly desirable to employ lower concentrations reducing a biolyte to a biostroph. Most of the items in the above classification are biostrophic, and they are by no means all injurious.

SMITH (C. R.), RICHARDSON (C. H.) & SHEPARD (H. H.). **Neonicotine and certain other Derivatives of the Dipyridyls as Insecticides.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 863–867, 5 refs. Geneva, N.Y., October 1930.

The relatively high toxicity of dipyridyl oil when compared with the dipyridyls isolated from the oil [*R.A.E.*, A, xv, 140] pointed to the presence of some other compound, probably a dipyridyl derivative, possessing high toxicity. The corresponding dipiperidyls and certain of the pyridyl piperidines were prepared and tested with the idea that it might be one of these, but the toxic compound was finally prepared in the pure state and identified as β-pyridyl α-piperidine [xviii, 648]. It was called neonicotine because its empirical formula is the same as that of nicotine and its toxicity is of the same order. The chemical structure is also very similiar, and it may be stated that no other possible pyridyl piperidine can compare so closely to nicotine as does neonicotine, its toxicity being decidedly greater than that of any other dipyridyl derivative yet tested. Graphic formulae are given representing the dipyridyls, pyridyl piperidines and dipiperidyls, and the physical characteristics of neonicotine are enumerated. The toxicity of each compound was determined by spraying the solutions or emulsions on dwarf nasturtium plants (*Tropaeolum majus*) infested with *Aphis rumicis*, L. After about 24 hours, the percentage of mortality was determined, and it was found that 99 per cent. of the Aphids had been killed by nicotine and neonicotine, 94 per cent. by nicotidine, and 90 per cent. by methylneonicotine. Although previously observed to be relatively ineffective [xi, 409], fish-oil soap (0·3 per cent.) killed about 45 per cent. of the Aphids in experiments made during these studies.

Of the three series of compounds involved in these studies, comprising a total of 25 dipyridyl derivatives and related compounds not pre-

viously reported, those showing the greatest toxicity are $\alpha\beta$-dipyridyl among the dipyridyl series and $\beta\gamma$-dipiperidyl among the 4 dipiperidyls. $\alpha\beta$-dipiperidyl as a base, however, might be more toxic, in which case the order of toxicity in each of the two series would be nearly the same as for the various isomeric forms. The dipiperidyls are for the most part more toxic than the corresponding dipyridyls.

The pyridyl piperidines are particularly interesting to compare with nicotine. The latter compound differs from them in chemical structure in that it contains a saturated five-membered ring (pyrrolidine) in place of a saturated six-membered ring (piperidine). The most toxic of the pyridyl piperidines is the $\beta\alpha$ isomer (neonicotine), corresponding structurally with nicotine in which the unsaturated and saturated rings are also attached in the $\beta\alpha$ position. Most remarkable is the fact that neonicotine has practically the same toxicity as nicotine. It is of much interest to note further that the $\alpha\beta$ isomer, although very much less toxic than neonicotine, is more toxic than the other compounds of the series that have been investigated. In each series the compounds with the $\alpha\beta$ and $\beta\alpha$ groupings lead in toxicity over the compounds with the rings located in other positions.

DAVIDSON (W. M.). **Rotenone as a Contact Insecticide.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 868–874, 1 ref. Geneva, N.Y., October 1930.

The following is taken from the author's summary: Preliminary tests against insects representative of different types amenable to control by contact insecticides indicate that rotenone, a product extracted from derris root, has a high degree of toxicity. The results obtained from the use of suspensions and dusts tend to confirm those reported by other investigators for derris extract. In suspensions, rotenone proved valuable against such soft-bodied insects as Aphids, thrips, leafhoppers and larvae of Coleoptera and Lepidoptera. When freshly dispersed in water by dilution of an acetone solution (4 gm. rotenone to 100 c.c. acetone), rotenone is effective against *Aphis rumicis*, L., at a concentration of 1 : 200,000, or about one-fifteenth of that at which nicotine is effective. Aqueous suspensions were not effective against adults of *Leptinotarsa* (*Doryphora*) *decemlineata*, Say, and *Diabrotica duodecimpunctata*, F., red spider (*Tetranychus telarius*, L.), mealybugs (*Pseudococcus citri*, Risso) or squash bugs (*Anasa tristis*, DeG.). This appears to be due, in the case of red spider and squash bugs, and possibly mealybugs, more to lack of penetrating power in the suspensions used than to absence of intrinsic toxicity, and would probably be remedied by incorporating rotenone in a penetrating carrier such as oil.

Dusts containing 1 or 2 per cent. rotenone were only moderately effective against soft-bodied sucking insects, but 1 per cent. dust controlled large larvae of *Pieris* (*Pontia*) *rapae*, L., and half-grown larvae of *Epilachna corrupta*, Muls.

DAVIDSON (W. M.). **The Relative Value as Contact Insecticides of some Constituents of Derris.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 877–879, 1 ref. Geneva, N.Y., October 1930.

The following is substantially the author's abstract: Aqueous suspensions of the four principal constituents of derris root, *viz.*,

rotenone, deguelin (pale green crystals, $C_{23}H_{22}O_6$, melting point 171° C.), tephrosin (colourless crystals, $C_{23}H_{22}O_7$, melting point 198° C.) and toxicarol (yellow crystals, $C_{23}H_{22}O_7$, melting point 219° C.) [*cf. R.A.E.*, A, xviii, 376, 690], were sprayed on Aphids (*Aphis rumicis*, L., and *Brevicoryne brassicae*, L.), thrips (*Thrips tabaci*, Lind.), white fly larvae (*Trialeurodes vaporariorum*, Westw.) and red spider mites (*Tetranychus telarius*, L.) living on potted plants in a greenhouse. Their relative contact insecticidal value was in the order given, with rotenone the most potent; with reference to *A. rumicis* they stood in the approximate ratio of 400 : 40 : 10 : 1. Rotenone and deguelin are both more toxic than nicotine to *A. rumicis*.

GLASSFORD (J.). **The Economics of Pyrethrum.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 874–877. Geneva, N.Y., October 1930.

Six-sevenths of the world production of pyrethrum flowers is now supplied by Japan. The imports into the United States have increased from 3,000,000 lb. in 1923 to 9,000,000 lb. in 1929. Average values have decreased from 2*s*. a lb. in 1923 to 9*d*. a lb. in 1929, but the cost of pyrethrum is still far in advance of that of any mineral insecticide. Recent investigations have shown, however, that when used with the proper materials to activate it, a spray of remarkably increased toxicity is obtained and the cost of spraying correspondingly reduced. A pyrethrum spray containing 0·04 per cent. of oleoresin of pyrethrum and activated with soap costs about 1*d*. per U.S. gal., whereas a lead arsenate spray costs only half that amount. In spite of their high price, pyrethrum sprays are indispensable for some purposes, and the efficiency and harmlessness of pyrethrum would doubtless lead to its extensive use if the obstacle of expense could be overcome. It has been suggested that an attempt in the direction of reducing the cost could be made by selecting and propagating a strain of *Chrysanthemum* (*Pyrethrum*) *cinerariaefolium* of higher toxic value than that now grown [*R.A.E.*, A, xvi, 11]. Gnadinger and Corl have found that pyrethrum flowers which have fully opened contain 18 – 61 per cent. more pyrethrin than the closed flowers, which for many years have been thought to be superior. As the weight of the open flowers is about double that of the closed, it is suggested that the weight of the toxic principles obtained per acre of pyrethrum cultivated may be trebled or quadrupled by allowing the flowers to reach maturity [*cf.* xviii, 639]. Sievers proposes to concentrate pyrethrum by threshing to separate the achenes, which contain 90 per cent. of the pyrethrin, thus saving both freight and cost of grinding and reducing the cost of extraction. It is possible that a reduction of the finished pyrethrum spray to one-half its present price may be effected, thus making it comparable with lead arsenate sprays. Similarly with pyrethrum dusts, though the cost of the pure powder is prohibitive, its extract carried on the surface of dust particles is much more efficient, and the cost of dusting is correspondingly reduced. Used in this way, the pyrethrins are efficient for some purposes at a dilution of 1 : 330,000.

Commercial prices of the two rotenone-containing insecticides, *Derris* from the East Indies and "cube" from South America [*R.A.E.*, A, xvii, 450; xviii, 357, 376], are not yet stabilised, but it is hoped that finished sprays may be made for about ½*d*. per U.S. gallon.

CORY (E. N.). **Argentine Ant in Maryland.**—*J. Econ. Ent.*, xxiii, no. 5, p. 882. Geneva, N.Y., October 1930.

Iridomyrmex humilis, Mayr, was discovered in certain greenhouses at Baltimore, Md., in 1930, but was not found in commercial greenhouses.

CROSBY (C. R.) & BLAUVELT (W. E.). **Clover Weevils become injurious to Beans.**—*J. Econ. Ent.*, xxiii, no. 5, p. 882. Geneva, N.Y., October 1930.

Hypera meles, F., and *H. nigrirostris*, F., are recorded, apparently for the first time, as causing serious injury to beans. Outbreaks were discovered during the latter part of July at 3 localities in New York State. Holes were eaten in the pods, stems and petioles, causing the leaves to wilt and die. As the injury in each case was most serious in the part of the field adjacent to a barn, it seems probable that the weevils were carried into the barns with clover hay, and on escaping from the building, were forced to feed on the beans.

COCKERELL (T. D. A.). **Silkworms and their Parasites in New Caledonia.**—*J. Econ. Ent.*, xxiii, no. 5, p. 882. Geneva, N.Y., October 1930.

Silkworms [*Bombyx mori*, L.] introduced into New Caledonia have been severely attacked by native Hymenopterous parasites. One of these is *Brachymeria* (*Chalcis*) *falsosa*, Vachal, and another *Lissopimpla* sp., possibly *L. pacifica*, Morley.

JAYNES (H. A.). **A Note on two Hymenopterous Parasites of** *Diatraea saccharalis* **F.**—*J. Econ. Ent.*, xxiii, no. 5, p. 882. Geneva, N.Y., October 1930.

Adults of *Microdus* (*Bassus*) *stigmaterus*, Cress., which has hitherto been recorded only from Cuba, have been collected in sugar-cane fields in Tucumán and Guëmes, Argentina, and have also been reared from cocoons and from a larva of *Diatraea saccharalis*, F., both found in maize. Four other adults of *M. stigmaterus* have been reared from cocoons found in the tunnels of *D. saccharalis* in maize at Moncada, Peru, but the parasite does not appear to be very abundant either in that country or in Argentina.

Two adults of *Apanteles xanthopus*, Ashm., have been reared from cocoons found at Tucumán in very small tunnels of *D. saccharalis* in maize ; it has not previously been recorded as a parasite of this moth.

MCCREARY (D.). *Dicymolomia julianalis* **Walk. predatory upon Bagworm Eggs.**—*J. Econ. Ent.*, xxiii, no. 5, p. 883. Geneva, N.Y., October 1930.

The Pyralid, *Dicymolomia julianalis*, Wlk., has been repeatedly reared from egg-masses of the bagworm, *Thyridopteryx ephemeraeformis*, Haw., in Maryland. The larvae were found feeding on the egg-masses, which were all eaten by the time larval maturity was reached. Two larvae, probably of this species, which were discovered

in dried pupal skins, also fed readily on the eggs of *T. ephemeraeformis*, but failed to pupate. This observation may indicate a change in the food habits of *D. julianalis*, which is normally a scavenger and feeds in the heads of *Typha*, and it confirms the only previous record from eggs of the bagworm, made in Maryland by A. B. Gahan in 1909, the authenticity of which has been questioned.

CHILDS (L.). **Nicotine in Paint for Woolly Aphis Control.**—*J. Econ. Ent.*, xxiii, no. 5, p. 883. Geneva, N.Y., October 1930.

None of the paints hitherto applied to wounds of various kinds in apple trees to protect them from infestation by the woolly aphis [*Eriosoma lanigerum*, Hausm.] and consequently attack by the fungus, *Gloeosporium perennans* [*R.A.E.*, A, xvii, 666] has been found in all cases to meet requirements in spring in respect of close adherence to the growing callus and expansion with the growth of the plant tissue. Nicotine sulphate (40 per cent.) was found greatly to increase the efficiency of paints containing an elastic adhesive base (tanglefoot) or a combination of resin, fish-oil and copper salts. The tanglefoot was diluted with both petrol and carbon tetrachloride, used alone and together, to a point where it could be applied with a brush. The tree paint was diluted with petrol. Complete control for the season resulted with 1 part of nicotine sulphate to 4 parts of the paints used; dilutions of 1 : 8 and 1 : 16 were proportionately less satisfactory. Extensive infestation developed on the calluses on which the paints were used without the addition of nicotine. In limited tests nicotine has been recovered from paints as long as 9 months after application. There is some evidence indicating that nicotine acts not only as a repellent but also as a contact poison to young Aphids seeking a situation for establishment.

HAEGELE (R. W.). **Two Leafhoppers of Apple and Prune in Southern Idaho and Eastern Oregon.**—*J. Econ. Ent.*, xxiii, no. 5, p. 884, 3 refs. Geneva, N.Y., October 1930.

Collections of leafhoppers made during the summer of 1930 in numerous orchards in southern Idaho and eastern Oregon showed *Empoasca maligna*, Walsh, and *Typhlocyba pomaria*, McAtee, to be common, attacking apple and prune, though *E. maligna* was comparatively rare on the latter. Some confusion appears to have existed as to the identity of the two species occurring in this district; they have probably previously been recorded as *Empoasca fabae*, Harr. (*mali*, LeB.) and *Typhlocyba rosae*, L., respectively [*R.A.E.*, A, iv, 267; vi, 243], neither of which occurred in these collections.

SNAPP (O. I.) & THOMSON (J. R.). **The Efficiency of the Air-blast Type of Sprayer for applying Insecticides.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 884–885. Geneva, N.Y., October 1930.

Lubricating oil emulsion (67·67 per cent. oil), at the rate of 9 gals. of the concentrate to 191 gals. water, and liquid lime-sulphur (32° Bé.), at the rate of 25 gals. to 175 gals., were used in an experiment conducted to compare the value of the air blast type of sprayer with that of the ordinary power spray outfit for applying dormant sprays to peach

trees for the control of the San José scale [*Aspidiotus perniciosus*, Comst.]. A tank load of each insecticide was applied by each method on an unusually calm day. One month after spraying, the average percentages of control secured by the air blast sprayer and the power outfit respectively were 95·9 and 94·7 with the oil, and 51·9 and 65·7 with the lime-sulphur.

SEÍN (F.), jr. *Dichomeris piperatus* **Walsingham, a Pest of Alfalfa in Puerto Rico.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 885–886. Geneva, N.Y., October 1930.

In view of a projected increase in the cultivation of lucerne in Porto Rico, a very brief description is given of the adult of *Dichomeris piperata*, Wals., one of the two important pests of this crop in the Island, where it becomes very abundant in spring. This Tineid was originally described from St. Vincent and was later bred from a leguminous plant in St. Thomas, West Indies. The native food-plant on which breeding takes place in Porto Rico has not been determined.

TUCKER (R. W. E.). **Sugar-cane Borers. The Control of** *Diatraea saccharalis* **in Barbados by Mass Liberations of** *Trichogramma minutum*.—*Trop. Agriculture*, vii, no. 11, pp. 292–295. Trinidad, November 1930.

The nature of the damage and the loss caused by *Diatraea saccharalis*, F., to the sugar-cane crop in Barbados is briefly reviewed. Further work on the mass breeding of *Trichogramma minutum*, Riley, and various factors that prevent the control of *D. saccharalis* by this parasite under natural conditions until late in the season are discussed [*cf.* *R.A.E.*, A, xvii, 614]. The life-cycle of *Trichogramma* is 8–9 days; that of its host (excluding the egg stage) is 30–31 days. Unless the infestation by the latter is sufficiently extensive to give a fairly continuous succession of broods and of egg deposition, the parasite cannot survive the full period when host eggs are not available in any one field. Another egg parasite, *Prophanurus alecto*, Cwfd., which, however, is less widely distributed, is present in considerable numbers in certain parts of the Island during the early part of the season, but is not suitable for breeding in the laboratory in large numbers. The methods recommended for distributing *T. minutum* in the field [*cf.* xvii, 614, 720] have proved successful. In 1929, the total number of parasites liberated was nearly 23 millions. During 1930, it was hoped to distribute a total of 50 to 60 millions. A table is given showing the effect of mass liberations of *T. minutum* during 1929 on the activities of *D. saccharalis* in 1930 as compared with those of 1929. The complete loss of cane in the field caused by the pest in 1929 is estimated at 31 per cent. as compared with 20·85 per cent. for 1930, and 55 per cent. of the canes at the factories were badly bored as compared with 19 per cent. Counts of the eggs of *Diatraea* collected in the same field, at fortnightly intervals, show that during September–November 11·1 per cent. more eggs were parasitised in 1929 than in 1928.

Various factors that interfered with the successful rearing of the parasites in the laboratory are discussed. They included a Gamasid

mite, *Seius* sp., which was predacious on the eggs and adults of *Sitotroga cerealella*, Ol. (the laboratory host), *Habrocytus cerealellae*, Ashm., a parasite of the latter, and *Ephestia kühniella*, Zell. The last-named moth hastened the deterioration of the grain on which *Sitotroga* was reared, and the adults were sucked by the vacuum into the collecting tubes with those of the latter. Though their eggs were parasitised, the larvae that emerged from those that had escaped parasitism devoured the rest of the eggs [*cf.* xviii, 590], and a serious diminution in the number of parasites was thus produced. The mite was successfully controlled by the use of sulphur [*cf.* xvii, 184], and no detrimental results due to its rendering the eggs laid by the moths repellent to *T. minutum* [*cf.* xviii, 70, 480] have been observed. *E. kühniella* and *H. cerealellae* were destroyed by hand crushing the adults and by fumigating with hydrocyanic acid gas, a sufficient dose being given to kill all adults and young larvae, but not the pupae of *S. cerealella*.

Future measures contemplated against *D. saccharalis* are discussed. The Tachinid, *Lixophaga diatraeae*, Towns., has been introduced from Cuba. Should it prove successful, it may be possible to diminish the mass liberation of *T. minutum*, or to confine such liberations to periods when *Lixophaga* is not active. The costs of planting borer-free cane and of breeding parasites are very low; taking the life of the initial equipment for rearing the parasites as four years, the annual cost of mass breeding can be put at less than 3*d*. an acre.

[Moroshkina (O. S.).] **Морошкина (О. С.).** *Toxoptera graminum* **Rond. (Biology, Ecology, Experiments in Control Measures.)** [*In Russian.*]—*J. Agric. Res. N. Caucasus*, no. 3 (20), pp. 19–78, 23 figs., 36 refs.; also as *Byull. Sev. Kavkaz. Kraev. S.-Kh. Opuit. Sta.* [Bull. N. Caucas. Agric. Expt. Sta.], no. 309, 60 pp., 23 figs., 36 refs. Rostov-on-Don, 1930. (With a Summary in English.)

Toxoptera graminum, Rond., all forms and stages of which are described, is one of the most important pests of cereals in the southern part of European Russia, and especially in the North Caucasus, where the studies described were carried out in 1926–29. Grasses are also attacked. The winter eggs hatch in mid-May and give rise to apterous females. At least 15 parthenogenetic generations occur during the season, and alate forms are produced in varying numbers from late May onwards, though they are rare when breeding reaches its maximum during the second half of June. From the beginning of July the Aphids begin to decrease in numbers owing to natural enemies. At the end of the month large colonies of both alate and apterous forms are present on fodder grasses only and are subject to the attacks of parasites, which are beginning to make their appearance. During the second half of September, alate females begin to migrate to the shoots of winter cereals. Sexual forms appear early in October and mating and oviposition begin; viviparous individuals are, however, still present. At the end of November, with the advent of cold weather, the insects disappear. A sexual female lives about 38 days and does not lay more than 12 eggs. These are usually deposited at the axils of the leaves of self-sown cereals, etc., in small batches of 2–4.

Experiments on the effect of temperature on the parthenogenetic females are discussed. The greatest number of larvae produced by such a female was 78, at a temperature of about 20·6° C. [69° F.]. Apterous females appeared to be more prolific than alate ones. Low temperature seemed to be one of the chief factors influencing the development of sexual forms ; these did not, however, appear before the fifth generation. Frost was apparently essential for the successful development of the egg.

Natural enemies play an important part in the control of *T. graminum*. Coccinellids, which appear to be of the greatest importance, include, in order of abundance, *Coccinella septempunctata*, L., *Adonia variegata*, Goeze, *Propylaea quatuordecimpunctata*, L., *Hippodamia tredecimpunctata*, L., and *Semiadalia undecimnotata*, Schnd. Brief notes are given on the biology of the first three. The Coccinellids hibernate as adults and first appear in April, but do not begin to attack the Aphids until after 20th May. Other predators include the Syrphids, *Lasiophthicus albomaculatus*, Macq., *Sphaerophoria flavicauda*, Zett., *S. scripta*, L., and *Syrphus corollae*, F., and *Chrysopa* sp., but the last-named is not abundant. The Syrphids are often attacked by Hymenopterous parasites, an Ichneumonid, *Bassus laetatorius*, F., being reared from their puparia on several occasions. A brief review is given of the Russian literature on the Hymenopterous parasites of *T. graminum*. The author found it to be attacked by *Aphidius* sp., *Aphelinus* sp. and *Encyrtus* sp., of which the last-named is a secondary parasite.

The nature of the injury caused by this Aphid [*cf. R.A.E.*, A, xviii, 162] and its food-plants are briefly discussed. Experiments showed that manuring increased the resistance of the plants and that barley and oats were the most susceptible to injury, whereas maize, though infested, was unaffected. Since plants are more susceptible during the early stages of growth, sowing cereals early in spring and late in autumn and the cultivation of early maturing varieties are recommended. After harvest, self-sown plants should be ploughed under to a depth of 6–7 ins., and in cases of severe infestation the soil should be rolled after ploughing. Of a number of contact insecticides tested, the most effective were a 1·5 per cent. solution of soap and a 0·08 per cent. solution of 95 per cent. nicotine.

[SHCHEGOLEV (V. N.).] **Щеголев (В. Н.). The Effect of the Damage caused by Insects in the Field on the Household and Market Value of small Grain.** [*In Russian.*]—*J. Agric. Res. N. Caucasus*, no. 3 (20), pp. 79–118, 2 figs., 47 refs. ; also as *Byull. Sev. Kavkaz. Kraev. S.-Kh. Opuit. Sta.* [Bull. N. Caucas. Agric. Expt. Sta.], no. 310, 40 pp., 2 figs., 47 refs. Rostov-on-Don, 1930. (With a Summary in English.)

This account is based on the author's observations, supported by data from the literature. It has been generally supposed that the quality of the harvested grain of cereals is affected only by such factors as climatic conditions, seasonal variations, nature of the soil, etc. ; the part played by insects in this connection has not been taken into consideration. The author classifies the injury caused to the plants by biting and sucking insects respectively according to the parts of the plant injured and the subsequent effect of the infestation, and

subdivides the damage into two types: injury to the planted seed, root system, stems, etc.; and injury to the inflorescence and the fruit (seeds, etc.). The results of observations conducted in the field and the laboratory on a number of injurious insects are discussed on these lines, and the results are given in tables. It is shown that the quality as well as the quantity of the harvested crop is affected.

[Mamonov (B. A.).] **Мамонов (Б. А.). Pests of the Castor Oil Plant in North Caucasus.** [*In Russian.*]—*J. Agric. Res. N. Caucasus*, no. 3 (20), pp. 119–140, 4 figs., 14 refs.; also as *Byull. Sev. Kavkaz. Kraev. S.-Kh. Opuit. Sta.* [Bull. N. Caucas. Agric. Expt. Sta.], no. 311, 22 pp., 4 figs., 14 refs. Rostov-on-Don, 1930. (With a Summary in English.)

In the North Caucasus, the castor oil plant (*Ricinus communis*) is attacked by 25 different species of insects; for the whole of the Russian Union 32 insect pests of this plant have been recorded. A list of these, which includes a brief description of the nature of the injury caused by them, is given, as well as a list of those recorded from other parts of the world. The species of particular importance in the North Caucasus include *Heliothis* (*Chloridea*) *obsoleta*, F., *Barathra brassicae*, L., *Phycita poteriella*, Zell., and *Euxoa segetum*, Schiff. *Loxostege sticticalis*, L., and *Phytometra gamma*, L., may also cause trouble during their periodical outbreaks.

An account is given of experiments with a number of insecticides, the effect of which was tested on the plants as well as on the pests. The results were somewhat inconclusive, but undiluted dusts of calcium arsenate or barium fluoride and a spray of 2 per cent. sodium fluoride are tentatively recommended. Sprays of 0·2 per cent. Paris green or 2 per cent. barium chloride were less toxic to the pests. Dusts of pure calcium arsenite or lead arsenite caused very severe injury to the plants.

[Shchegolev (V. N.).] **Щеголев (В. Н.). Pests of** *Arachis hypogaea* **in North Caucasus.** [*In Russian.*]—*J. Agric. Res. N. Caucasus*, no. 3 (20), pp. 141–150, 2 figs., 7 refs.; also as *Byull. Sev. Kavkaz. Kraev. S.-Kh. Opuit. Sta.* [Bull. N. Caucas. Agric. Expt. Sta.], no. 312, 10 pp., 2 figs., 7 refs. Rostov-on-Don, 1930. (With a Summary in English.)

Investigations in 1927–28 indicate that the most injurious of the insect pests of ground-nuts (*Arachis hypogaea*) in the North Caucasus are those attacking the underground parts of the plants, particularly the ants, *Solenopsis fugax*, Latr., and *Tetramorium caespitum*, L., which bore into and destroy the fruit in the soil. The use of a poison bait [*R.A.E.*, A, xvi, 667] is recommended. Tests showed that the addition of sugar increased its attractiveness. Other insects attacking the underground parts of the plant were *Gryllotalpa gryllotalpa*, L., and Coleopterous larvae, including *Pentodon idiota*, Hbst., *Agriotes gurgistanus*, Fald., and *Podonta daghestanica*, Reitt. A poison bait recommended against *Gryllotalpa* is prepared by boiling 20 lb. maize in a solution of 1 lb. sodium arsenite and 2 gals. water until the grains become quite soft; these should then be buried in the soil at a depth of about ¾ in. Collecting the crickets in the spring from manure heaps is also suggested.

Pests attacking the aerial parts of the plants include *Aphis laburni*, Kalt., *Calliptamus italicus*, L., which may be injurious during outbreaks, *Loxostege sticticalis*, L., *L. verticalis*, L., various Noctuids, of which all but *Barathra brassicae*, L., *Heliothis* (*Chloridea*) *dipsacea*, L., and *H.* (*C.*) *peltigera*, Schiff., have already been noticed [xviii, 670], and a mite, probably *Tetranychus telarius*, L. (*Epitetranychus altheae*, von Hanst.), which has been observed in small numbers on the foliage. Various dusts and sprays for controlling them are briefly discussed. Insecticides that did not scorch the foliage included a spray of Paris green (0·4 and 0·2 per cent.) and a calcium arsenate dust. A key is given for the determination of the insects concerned in the stage in which they attack the plant, based on their morphological characters and the injury caused.

[Mamonov (B. A.).] **Мамонов (Б. А.). Observations on *Loxostege sticticalis* and the Results of Tests of the Action of Insecticides on cultivated Oil Plants.** [*In Russian.*]—*J. Agric. Res. N. Caucasus*, no. 3 (20), pp. 165–230, 23 figs., 19 refs.; also as *Byull. Sev. Kavkaz. Kraev. S.-Kh. Opuit. Sta.* [Bull. N. Caucas. Agric. Expt. Sta.], no. 314, 66 pp., 23 figs., 19 refs. Rostov-on-Don, 1930. (With a Summary in English.)

A detailed account is given of observations on *Loxostege sticticalis*, L., in the North Caucasus, where an unusually severe outbreak occurred in 1929. A light-trap for collecting the moths, which is briefly described, was used throughout the investigations. The moths first began to appear in the middle of May, and the peak of the flight of the overwintered generation was reached about 1½ to 3 weeks later. They are on the wing from 7 or 8 a.m. until after sunset. Experiments showed that higher temperatures accelerate egg-laying, but do not increase the total number of the eggs laid, as the moths do not live so long. The overwintered generation was more fertile than the first, laying under laboratory conditions 44–50 eggs on an average, as against only 19·3. The egg stage lasts from 2 to 4 days. Larvae of the first generation first began to appear at the end of May, and were most numerous towards the middle of June, when lucerne and other fodder plants were chiefly attacked and some individuals were about to pupate. Larvae of the second generation were far less abundant than those of the first, and those of the third were very scarce indeed. A list of food-plants of *L. sticticalis* is given, and the extent to which some plants are more attractive and are more seriously injured than others is discussed.

The pupal stage, which is passed in the soil, lasts 13–19 days. Dissection of first generation cocoons showed that about 0·4 per cent. of the larvae had entered a diapause. The second generation pupated between 9th and 12th August. Various factors influencing the numbers of the moths are discussed. Under certain climatic conditions they experience difficulty in emerging from their cocoons, which are constructed in such a manner that the exit is level with the surface of the ground. When the cocoons were partly or entirely exposed by heavy rains and then dried by the sun, 19 per cent. of the moths failed to emerge as a result. Preliminary investigations to determine the causes responsible for the partial sterility of the moths of the second generation indicate that low humidity is responsible in some manner.

In 1929, parasites were not very prevalent in the first generation, but larvae of the second were very severely infested. From 200 larvae collected in the field on 6th July, 21 moths and 93 parasites were obtained between 15th and 27th August. Tachinids were predominant in both generations. Among the most common parasites were *Tachina erucarum*, Rond., *Zenillia pullata*, Mg., *Z. libatrix*, Panz., *Eulimneria geniculata*, Grav., *E. rufifemur*, Thoms., and *Cardiochiles katkowi*, Kok. Ichneumonids apparently recorded for the first time as parasites of this pest were *Angitia fenestralis*, Holmgr., *Cremastus decoratus*, Grav., *Labrorychus tenuicornis*, Grav., *Mesochorus pallidus*, Brischke, and *Omorgus exoletus*, Thoms. The Carabids, *Calosoma denticolle*, Gebl., *C. investigator*, Ill., and *C. auropunctatum*, Hbst., the larvae of which are predacious on the pupae of *L. sticticalis*, were unusually abundant during 1929. *C. denticolle*, the larva of which is briefly described, was the most important. The larvae were most active between 18th and 24th June, and in one locality about 45 per cent. of the cocoons of the first generation of the moth were destroyed by these beetles.

In experiments in which cocoons were buried in fine, light soil in boxes, a depth of only 1 or 2 ins. was sufficient to prevent the emergence of the moths. Ploughing the cocoons under in the field, however, did not produce any apparent effect on the number of moths emerging.

Tests of the effect of sprays and dusts on oil-producing plants and on the larvae are described in detail. The insecticides that gave the best results (a fairly high toxicity with little if any injury to the plants) were 2 per cent. sprays of lead arsenate, Paris green, sodium fluoride or barium chloride, and dusts of pure calcium arsenate or equal parts of barium fluoride or lead arsenate and lime.

[KOSTENKO (M. [N.] K.).] **Костенко (М. [Н.] К.). The Effect of Paradichlorobenzene on the Larvae of** *Polyphylla fullo* **L. in Relation to the Time of its Introduction into the Soil.** [*In Ukrainian.*]—*Trudi Oleshk. pischano-meliorativn. dosvidn. Sta., Dosvidn. Viddil* [Works of the Sand Improvement Expt. Sta., Oleshki, Expt. Section], pt. ii, pp. 3–14, 1 ref.

[KOSTENKO (M. [N.] K.).] **Костенко (М. [Н.] К.). On the Question of mechanical Means for introducing Paradichlorobenzene into the Soil.** [*In Ukrainian.*]—*T.c.*, pp. 15–27, 3 figs., 2 refs. Tzyurupins'ke, 1928. [Recd. 1930.]

In the first paper, a more detailed account is given of some of the experiments against *Polyphylla fullo*, L., in the vineyards of the Lower Dnieper discussed in a subsequent report [*R.A.E.*, A, xvii, 306].

In the apparatus described in the second paper, two wooden shafts, provided with handles at the top and iron tips at the bottom, are set at a sharp angle meeting at a point on the surface of the ground; a metal tube is attached to one of the shafts with a clamp. Near the top of the shaft that holds the tube is attached a small platform, through a hole in which passes the other shaft, so that it can be moved a few inches towards or away from the first. On the platform is a box, fitted at the bottom with a sliding piece of wood and having an opening into the tube, and at the top another opening to hold a funnel containing paradichlorobenzene. A small bottomless box, just large enough to contain the necessary dose of crystals, is fixed to the sliding piece of wood, the latter, in its turn, being fixed to the shaft opposite

the one attached to the tube. When the shaft is pulled back, the small box comes under the opening into the funnel and the paradichlorobenzene crystals fall into it. At the same time the tips of the shafts join, this being the moment when they should be inserted into the soil by pressing the foot on a pedal. By pushing together the handles, the small box is carried over the opening into the metal tube, thus the crystals are released into it and introduced into the soil, as the iron tips part at the same time.

The depth of the application is regulated by the pedal, which may be adjusted at the necessary height.

Tests, which are described, showed this apparatus to be superior to one already noticed [xvi, 430], or to the usual method of applying paradichlorobenzene with a spade, as the work could be carried out more quickly and with half the number of men.

[Kostenko (M. [N.] K.).] **Костенко (М. [Н.] К.). An Experiment in the Control of the Larvae of *Polyphylla fullo* L. in the Lower Dnieper Sands by applying Polychlorides to the Soil.** [*In Ukrainian.*]—*Trudi Oleshk. pischano-meliorativn. dosvidn. Sta., Dosvidn. Viddil* [Works of the Sand Improvement Expt. Sta., Oleshki, Expt. Section], pt. iii, 24 pp., 5 figs., 2 refs. Tzyurupins'ke, 1930. (With a Summary in Russian.)

In the field experiments described in this paper, which were carried out in the Ukraine in 1928 and 1929, residue from the manufacture of chlorinated benzene was used. This residue, the properties of which are discussed, varied in composition, but consisted chiefly of ortho-, meta-, and para-dichlorobenzene. All the larvae of *Polyphylla fullo*, L., and various other Lamellicorns were killed when the fumigant was placed in holes 14 ins. apart (the lines of holes being also 14 ins. apart) at the rate of 0·35 oz. to each hole, which requires $6\frac{1}{3}$ cwt. to the acre, but equally good results were subsequently obtained with doses of 0·7 oz. in holes 28 ins. apart, which only requires $3\frac{1}{3}$ cwt. to the acre. The holes should be 8 ins. deep; at 4 ins. deep the mortality fell to 95·5 per cent. Treatment of the soil at the time of planting the vine seedlings resulted in the death of most of them within three weeks and in severe injury to the others, but vines planted in soil that had been treated in the preceding year developed normally, except when the quantity of the fumigant had been over $6\frac{1}{3}$ cwt. to an acre.

Papers noticed by Title only.

Clément (E.). **Opuscula hymenopterologica III. Die Paläarktischen *Metopius*-Arten (Hym., Ichneumon.).** [The Palaearctic Species of *Metopius* (with a list of hosts).]—*Konowia,* viii, no. 4, pp. 325–437. Vienna, 1930.

Habermehl (H.). **Neue und wenig bekannte paläarktische Ichneumoniden. V. Nachtrag.** [New and little known Palaearctic Ichneumonids, 5th Supplement.]—*Konowia,* ix, no. 2, pp. 109–117. Vienna, 1930.

Heinrich (G.). **Beitrag zur Kenntnis der Ichneumonidenfauna Jugoslaviens.** [A Contribution to the Knowledge of the Ichneumonids of Jugoslavia.]—*Konowia,* ix, no. 2, pp. 118–126. Vienna, 1930.

von Winning (E.). **Stand der Kartoffelkäferfrage in Frankreich zu Beginn des Sommers 1930.** [The Situation regarding the Potato Beetle (*Leptinotarsa decemlineata*, Say) in France at the Beginning of the Summer of 1930.]—*NachrBl. deuts. PflSchutzDienst*, **x**, no. 11, pp. 91–94, 1 map. Berlin, November 1930. [*Cf. R.A.E.*, A, xviii, 595.]

Goux (L.). **Notes sur les Coccides (Hem. Coccidae) de la France. I. Note préliminaire : Monophlebinae, Ortheziinae, Dactylopiinae, Eriococcinae.**—*Bull. Soc. ent. Fr.*, 1930, no. 20, pp. 330–333. Paris, 1930.

[Shchegolev (V. N.).] **Щеголев (В. Н.). Report on the ten Years' Work of the Entomological Department of the North Caucasian Regional Agricultural Experiment Station.** [*In Russian.*]—*J. Agric. Res. N. Caucasus*, no. 3 (20), pp. 3–18, 3 figs., 50 refs. ; also as *Byull. Sev. Kavkaz. Kraev. S.-Kh. Opuit. Sta.* [*Bull. N. Caucas. Agric. Expt. Sta.*], no. 308, 16 pp., 3 figs., 50 refs. Rostov-on-Don, 1930. (With a Summary in English.)

Webber (R. T.). **A Revision of the North American Tachinid Flies of the Genus** *Achaetoneura* [including 10 new species].—*Proc. U.S. Nat. Mus.*, lxxviii, art. 10, no. 2853, 37 pp., 14 figs., 25 refs. Washington, D.C., 1930.

Robinson (V. E.). **The Mouth-parts of the larval and adult Stages of** *Dermestes vulpinus* **F.**—*Ann. Ent. Soc. Amer.*, xxiii, no. 3, pp. 399–416, 2 pls., 2 pp. refs. Columbus, Ohio, September 1930.

Gibson (A.). **Contributions of major Importance which North America has made to the Study of Insects : Contributions to Applied Entomology.**—*Ann. Ent. Soc. Amer.*, xxiii, no. 3, pp. 537–542. Columbus, Ohio, September 1930.

Gillette (C. P.) & Palmer (M. A.). **Three** [four] **new Aphids from Colorado.**—*Ann. Ent. Soc. Amer.*, xxiii, no. 3, pp. 543–551, 2 pls. Columbus, Ohio, September 1930.

Newcomer (E. J.). **Experiments in killing Eggs of the Codling Moth** [*Cydia pomonella*, L.] **on harvested Fruit.**—*J. Econ. Ent.*, xxiii, no. 5, pp. 798–802, 2 refs. Geneva, N.Y., October 1930. [*Cf. R.A.E.*, A, xviii, 540.]

List of Pests intercepted on imported Plants and Plant Products during the Calendar Year 1929.—*S.R.A., P.Q.C.A.*, 1929, pp. 249–331. Washington, D.C., U.S. Dept. Agric., P.Q.C.A., December 1930.

Back (E. A.) & Cotton (R. T.). **Stored-grain Pests.**—*Fmrs'. Bull. U.S. Dept. Agric.*, no. 1260 (revd.), 46 pp., 69 figs. Washington, D.C., June 1930. [*Cf. R.A.E.*, A, x, 594.]

Pickel (B.). **Sobre um Coleoptero perfurador de cabos telephonicos observado em Pernambuco** (*Megaderus stigma* **L., Col. Ceramb.**). [A Beetle Borer of Telephone Cables observed in Pernambuco (*M. stigma*).]—*Bol. Mus. nac. Rio de Janeiro*, v, no. 4, pp. 35–38, 1 pl., 2 refs. Rio de Janeiro, 1929. [*Cf. R.A.E.*, A, xix, 12.]

Takahashi (R.). **Notes on some Chinese Aphididae** [including one new species].—*Lingnan Sci. J.*, ix, no. 1–2, pp. 9–11. Canton, August 1930.

Williams (F. X.). *Beebea guglielmi* **Schaus, a Pyralid Moth Borer of the** *Opuntia* **Cactus in the Galapagos Islands.**—*Pan-Pacific Ent.*, vii, no. 1, pp. 1–4, 5 figs. San Francisco, Cal., July 1930.

Walsh (G. B.). **The Preparation of Aphids for the Microscope.**—*Vasculum*, xvii, no. 1, pp. 11–12. Newcastle-upon-Tyne, February 1931.

[Bogdanov-Kat'kov (N. N.).] **Богданов-Катьков (Н. Н.). A short Manual of theoretic and applied Entomology. 2nd enl. edn.** [*In Russian.*]—Demy 8vo, 535 pp., 416 figs. Moscow, State Pub., 1930. Price 5 *r.* 50 *kop.* Binding 40 *kop.*

This handbook is a considerably enlarged edition of one already noticed [*R.A.E.*, A, xvii, 423]. About 100 pages are devoted to a general account of the physiology, metamorphosis, classification, biology and economic importance of insects, and 70 pages to cultural, biological, mechanical and chemical methods of controlling them. The bulk of the book consists of notes on the bionomics of a large number of the pests occurring in the Russian Union, divided according to the crops infested, and including chapters on insects injurious to forests and stored products, and those attacking man and domestic animals. An extensive bibliography and a list of the more important cultivated plants with the pests attacking them are appended, as well as indices to the scientific and Russian names of the insects.

Saunt (J. W.). **Some American Immigrants.**—*Ent. Rec.*, xliii, no. 1, pp. 11–12. London, January 1931.

The periodic occurrence in ash imported from America of quantities of larvae of two Cerambycids, *Neoclytus acuminatus*, F. (*erythrocephalus*, F.) and *N. caprea*, Say, particularly the former, causes great destruction to this timber and consequent loss to motor-body manufacturers in Britain. This involves both actual damage to the timber and wasted labour in that the damage is not always revealed till after the coach pillars have been operated on several times. It is not unusual to find living larvae, pupae and adults in one piece of timber, but although on some occasions the beetles may be found wandering about the sawmills on their emergence, there appears to be no sign of their being established.

Another American Cerambycid, *Tylonotus bimaculatus*, Hald., is rare ; the larvae do not penetrate the interior of the wood, but usually feed between it and the bark. Borings in American ash made by the larvae of the Cossid, *Prionoxystus robiniae*, Peck, are also occasionally observed, and newly emerged adults have twice been found.

Cameron (A. E.). **Two Species of Anthomyiid Diptera attacking Bracken and their Hymenopterous Parasites.**—*Scot. Nat.*, no. 185, pp. 137–141, 2 refs. Edinburgh, 1930.

The Anthomyiids, *Chirosia parvicornis*, Zett., and *C. crassiseta*, Stein, are recorded as attacking bracken in Scotland, the former feeding on the leaf tissue and the latter mining in the stems. Both species hibernate as pupae, which are heavily parasitised. From the former the Braconid, *Phaenocarpa conspurcator*, Hal., and the Cynipid, *Eucoila scotica*, Cam., were obtained, and from the latter the Ichneumonid, *Phygadeuon fumator*, Grav., a Eurytomid, *Halticoptera* sp., and a Pteromalid, *Sphegigaster* sp.

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Manhardt (—). **Ein neuer Obstschädling.** [A new Fruit Pest.]—*Int. ent. Z.*, xxiv, no. 36, pp. 385–386. Guben, 22nd December 1930.

After stripping the willow bushes on the banks of the Elbe in 1930, large numbers of the Galerucid, *Luperus xanthopus*, Schr., made their way inland and attacked fruit trees of all kinds, especially pears. The leaves were skeletonised just as the fruit was setting, and so much damage was caused that the fruit harvest in one district was practically ruined. In July the beetles, which have never before been observed in such destructive numbers, suddenly disappeared.

Ripper (W.). **Zur Frage des Celluloseabbaus bei der Holzverdauung xylophager Insektenlarven.** [On the Question of the Disintegration of Cellulose in the Digestion of Wood by the Larvae of xylophagous Insects.]—*Z. vergl. Physiol.*, xiii, no. 2, pp. 314–333, 4 figs., 29 refs. Berlin, 1930.

The question of the disintegration and digestion of cellulose by insects has been studied by physiological methods with larvae of *Cossus cossus*, L., *Dorcus parallelepipedus*, L., *Osmoderma eremita*, Scop., *Cerambyx cerdo*, L., and *Xestobium rufovillosum*, DeG. No digestion of cellulose takes place with the first three species, but a cellulase was found to occur in *C. cerdo* and is probably present in *X. rufovillosum*. *C. cerdo* is free from symbionts, and the finding of a cellulase in it deprives Buchner's theory of its chief basis, namely that insects possess no cellulase and that therefore symbionts are the cause of disintegration of cellulose by them [*cf. R.A.E.*, A, xvi, 213 ; xix, 73].

Zweigelt (F.). **Blattlausgallen. Histogenetische und biologische Studien an** *Tetraneura-* **und** *Schizoneura-***gallen. Die Blattlausgallen im Dienste prinzipieller Gallenforschung.** [Aphid Galls. Histological and biological Studies on Galls produced by *Tetraneura* and *Eriosoma*. Aphid Galls as an Aid in the basic Investigation of Galls.]—*Monog. angew. Ent.* no. 11, *Z. angew. Ent.*, xvii, Beiheft, xxi+684 pp., 155 figs., 5 pls., 479 refs. Berlin, Paul Parey, 1931. Price, paper, *M*.52.

The object of this volume is to bring the knowledge of Aphid galls into line with the advanced position of that pertaining to galls caused by Hymenoptera. The special part deals with *Tetraneura ulmifoliae*, Baker (*ulmi*, L.) and *Eriosoma* (*Schizoneura*) *ulmi*, L., and the structure of the galls produced by these Aphids. The general part treats of galls and their formation, and of their adaptation and its consequences to the insect and to the plant.

Manzoni (L.). **Di un nuovo nemico della vite.** *Plagitmesus erythrocephalus.* [A new Pest of the Vine, *Neoclytus acuminatus*, F.]—*Giornale Agric. Domenica*, xl, no. 45, p. 582. Piacenza, 1930.

In a previous article [*R.A.E.*, A, xviii, 449], the larvae of the Cerambycid, *Neoclytus acuminatus*, F. (*Plagitmesus erythrocephalus*, F.) were recorded from Italy as boring in the branches of grape-vine. It has since been ascertained that only dead or dying vines are attacked, and experiments showed that eggs were not laid on living ones.

Ramalho (A. G.). **Subsídios para a história das invasões do " burgo " em Portugal.** [Materials for a History of the Outbreaks of *Tortrix viridana* in Portugal.]—*Arq. Sec. Biol. Paras. Univ. Coimbra*, i, no. 1, pp. 27–47. Coimbra, 1929. [Recd. November 1930.]

This posthumous paper, which was written in 1894–95, constitutes a record of the outbreaks in Portugal of *Tortrix viridana*, L., a serious pest of *Quercus ilex*, and gives an account of its natural enemies and the control measures believed to be of value at that date.

Hargreaves (E.). **Annual Report of the Entomological Section for the Year 1929.**—*Ann. Rep. Agric. Dept. Sierra Leone 1929*, pp. 16–18. Freetown, 1930.

In 1929, crickets, including *Brachytrypes membranaceus*, Dru., and *Gryllus lucens*, Wlk., caused damage in *Citrus* nurseries in Sierra Leone. Frequent rains rendered the poison bait used against *G. lucens* ineffective, but satisfactory results were eventually obtained by digging the crickets out each morning, the position of the burrows being indicated by small mounds of earth. Damage by crickets occurs almost invariably on newly cultivated ground. Injury to the main stems of young cacao and coffee plants was caused by *Xyleborus compactus*, Eichh., and to larger coffee plants by the Cossid, *Xyleutes armstrongi*, Hmps. Painting the stems with a mixture of lead arsenate and lime prevented further damage. *Aspidiotus harti*, Ckll., caused a loss of 22·5 per cent. in weight to stored ginger, as compared with the uninfested ginger, when both materials were stored under identical conditions for 175 days. A similar comparison made two years previously showed a loss of 14 per cent. in 128 days.

In one district, *Brachytrypes membranaceus* and *Gryllus lucens* caused injury to oil palm [*Elaeis guineënsis*] in nurseries. Infestation of the fruit by Coccids has increased considerably during the past few years [*cf. R.A.E.*, A, xviii, 99], and it is considered that they seriously affect the quality of the pericarp oil. The species identified were *Diaspis lutea*, Newst., *Aspidiotus lataniae*, Sign., *Pinnaspis aspidistrae*, Sign., *Chrysomphalus rossi*, Mask., *Leucaspis cockerelli*, d'Emm., *Phenacaspis* sp., and *Pseudococcus brevipes*, Ckll. Harvest records indicate that dusting with calcium cyanide gave some results in their control, since 7 treated palms yielded 47 fruit heads, of which only 4 were infested. The average infestation for the whole plantation was about 20 per cent. Eggs of *Zonocerus variegatus*, L., were dug up from the breeding-places [*cf. loc. cit.*], and the effects of this were very noticeable towards the end of the year, when hatching normally occurs. Some of the eggs hatched in one locality during April and May, and a poison bait [xv, 489] was applied. It has been found practicable to reduce the quantities of Paris green and salt contained in this bait by half.

Hill (G. F.). **Some Aspects of Wood Preservation in Australia. 3. Termites (White Ants).**—*J. Council Sci. Ind. Res.*, iii, no. 3, pp. 141–146, 7 refs. Melbourne, August 1930.

A general account is given of the bionomics and classification of termites, with particular reference to those occurring in Australia,

which are also grouped according to their nesting and feeding habits. Of these the most injurious is *Mastotermes darwiniensis*, Frogg., which is, however, confined to tropical Australia. It constructs subterranean nests and attacks almost all kinds of organic matter, including a variety of economic plants and manufactured products. Species of *Coptotermes*, which construct mounds or build their nests in trees, are widely distributed and destructive. Among the non-subterranean termites only *Porotermes* and species of the subgenus *Neotermes* of *Calotermes* appear to be of importance; they attack growing trees, and the former rotten and the latter dry wood, but it is not known to what extent they are responsible for the destruction of *Eucalyptus*. The distribution of the Australian genera of termites and the lines on which research for their control should be conducted are briefly outlined.

Noogoora Burr.—*J. Council Sci. Ind. Res.*, iii, no. 3, pp. 183–184, 4 refs. Melbourne, August 1930.

As a result of a study of insects attacking *Xanthium* in the United States with a view to their utilisation for the biological control of the Noogoora burr in Australia, a consignment of pupae of the Trypetid, *Euaresta aequalis*, Lw., has been received at Canberra. When they were placed in a warm room, the flies emerged and paired, and eggs were laid on the seeds in the young burrs. In one case a larva was seen in the process of hatching and later it burrowed into the seed. A note by J. Calvert is appended, discussing the classification of the Australian Noogoora burr; it is concluded that its correct botanical name is *Xanthium pungens*.

Entomological Investigations in Western Australia and Tasmania: The Red-legged Earth Mite and the Clover Springtail (Lucerne Flea).—*J. Council Sci. Ind. Res.*, iii, no. 3, pp. 189–190. Melbourne, August 1930.

The problems of the red-legged earth mite and the clover springtail (*Smynthurus viridis*, L.) in Western Australia are being investigated by H. Womersley. From preliminary studies in Britain he concludes that the correct name of the mite that is prevalent in Western Australia is *Halotydaeus* (*Penthaleus*) *destructor*, Tuck., and that of the mite in Eastern Australia *Penthaleus* (*Notophallus*) *bicolor*, Frogg. The Smynthurids recorded from Tasmania are *Smynthurus viridis*, L. (green clover springtail), *Bourletiella lutea*, Lubb. (golden clover springtail), *B. hortensis*, Fitch (garden springtail) and two undescribed species.

Jackson (T. P.). **Work connected with Insect and Fungus Pests and their Control.**—*Rep. Agric. Dept. St. Vincent 1929*, pp. 7–10. Trinidad, 1930.

The minor cotton pests and pests of miscellaneous crops recorded have been noticed in a previous report [*R.A.E.*, A, xv, 51].

In 1929, cotton in St. Vincent was not attacked by *Alabama argillacea*, Hb. On the Island of Mustique, some infestation occurred late in the season, but was controlled by applications of Paris green. *Platyedra gossypiella*, Saund., was less injurious than it has

been since it was first recorded in St. Vincent. This was probably due to several factors, including an extension of the close season (no cotton was planted before 1st September, and all old plants were destroyed before 27th April). The measures employed against the cotton stainer, *Dysdercus discolor*, Wlk. (*delauneyi*, Leth.) [xviii, 223], have been continued, and it was at no time numerous during the season. The first broods of the Eumolpid, *Colaspis fastidiosa*, Lef. (bronze beetle) usually occur on cotton seedlings during May or June, when the plants are most susceptible to injury, and at times interfere with the formation of regular stands in cotton. In 1929, serious injury was avoided by the late planting of cotton.

Russo (G.). **Il deperimento delle piantagioni di cacao nella Repubblica Dominicana.** [The Decline of Cacao Plantations in the Republic of Santo Domingo.]—*Agric. colon.*, xxiv, no. 10, pp. 505–524, 4 pls. Florence, October 1930.

The insects of economic importance on cacao in Santo Domingo are a termite, *Nasutitermes morio*, Latr.; *Pseudococcus citri*, Risso, against which the introduction of the predacious Coccinellids, *Cryptolaemus montrouzieri*, Muls., and *Scymnus binaevatus*, Muls., and the parasite, *Tanaomastix abnormis*, Gir., is suggested; and *Selenothrips rubrocinctus*, Giard, which is the most injurious. During the dry season this thrips increases to such an extent as to cover the lower surfaces of the leaves, but it is washed away by rain. It is estimated that 75 per cent. of the cacao plantations are injured, owing to the absence of suitable shade. This can be obtained rapidly by planting bananas, but *Erythrina micropteryx* should be grown for permanent shade until a more satisfactory tree with a less extensive root-system can be found. The addition of nicotine to the Bordeaux mixture used as a fungicide is effective against this thrips.

de Figueiredo (R.). **Como descobrir e destruir os ninhos da abelha-cachorro ou irapua'** (*Melipona ruficrus*), **grande inimiga dos nossos pomares.** [How to discover and destroy the Nests of *M. ruficrus*, a great Enemy of our Orchards.]—*Chacaras e Quintaes*, xlii, no. 4, pp. 393–394, 1 fig. S. Paulo, 15th October 1930.

Melipona ruficrus, Latr., is a serious pest of fruit trees in S. Paulo, destroying the leaves, fruits and buds. Any of these bees that can be captured towards nightfall should be released and followed far enough to enable the nest to be found the next day. The nest should then be burnt out by means of rags soaked in kerosene thrust against the entrance hole with a long rod.

Bondar (G.). **A formiga de enxerto, praga dos cacaoaes na Bahia.** [*Azteca paraensis*, Forel, a Pest of Cacao Plantations in Bahia.]—*Correio agric.*, viii, no. 9, pp. 245–249, 5 figs. Bahia, September 1930.

The ant, *Azteca paraensis*, For., is a serious pest of cacao in Bahia. It encourages Coccids, is troublesome to those working in the plantations, and causes direct injury by destroying the shoots, buds, leaves

and pods, thus killing the trees. The author believes that it also promotes the occurrence of epiphytic plants, such as orchids, in the roots of which it nests, by distributing their seeds. All nests should be removed and burned or submerged in a 3-4 per cent. solution of carbolineum or in water with an inch-deep layer of oil on the surface.

FLANDERS (S. E.). **Mass Production of Egg Parasites of the Genus** *Trichogramma.—Hilgardia,* iv, no. 16, pp. 465–501, 17 figs., 26 refs. Berkeley, Cal., June 1930.

The characters of the genus *Trichogramma* are discussed from the literature. The species most commonly found in Europe and America are respectively *T. evanescens,* Westw., and *T. minutum,* Riley. The characteristics that determine the adaptability of *Trichogramma* to biological control work are briefly enumerated, and the effect of farm practices on its abundance and the methods adopted by earlier workers for increasing the parasite population are discussed. Experiments in mass production of *T. minutum* were begun in August 1926, when *Sitotroga cerealella,* Ol., was found to be the most suitable laboratory host among a number tested. One egg of *S. cerealella* rarely yields more than one parasite, but larger eggs, which allow of the development of more than one, may produce under laboratory conditions parasites smaller and weaker than those from *Sitotroga* eggs. If the shell of the host egg is relatively hard, the parasites may be unable to emerge. The longevity of parasites reared on the eggs of *Ephestia cautella,* Wlk., appears to be much shorter than that of those reared on *S. cerealella.*

Numerous generations of *Sitotroga* can be reared in rapid succession from stored grain under regulated conditions. The life-cycle of this moth in the laboratory is about 28 days and its fecundity at least 50 eggs per female. The newly hatched larvae are negatively phototropic and positively geotropic, so that grain in bulk can easily be infested. As the feeding and pupal stages occur within the kernels of the grain, leaving the interspaces unencumbered with frass and webbing, the newly emerged moths have free egress from the deeper layers. These moths are as flexible in their movements as the larvae and are at first negatively geotropic and thigmotropic, so that they all emerge from compactly arranged, tilted bins. They return to the grain to oviposit, but do not remain there. The moths mate promptly after emergence, and their preoviposition period is less than 24 hours under laboratory conditions, maximum oviposition occurring within 60 hours. During the day they tend to crawl upward and come to rest in positions of positive thigmotropism and negative phototropism. Loose boards resting against vertical surfaces serve as traps. Although rarely attacked by bacterial or fungous diseases, *S. cerealella* suffers from the ravages of *Pediculoides ventricosus,* Newp. Another mite, *Tyroglyphus* sp., feeds on the eggs, *Cryptolestes pusillus,* Schon., attacks the newly hatched larvae, and *Dibrachys cavus,* Wlk. (*boucheanus,* Ratz.) parasitises the pupae.

A chronological account is given of the development of rearing methods in the United States and Mexico from 1926 to 1928 [*cf. R.A.E.*, A, xvi, 87, 567 ; xvii, 383, 455, 559 ; xviii, 301, 479, 577] ; subsequent papers have also been noticed [xix, 95].

Reyne (A.). **Over den invloed der weersgesteldheid op het min of meer talrijk voorkomen der cacaothrips in Suriname.** [On the Influence of Weather on the Abundance of the Cacao Thrips, *Selenothrips rubrocinctus*, Giard, in Surinam.] **Over de groene luis** (*Lecanium viride* **Green) van Liberia-koffie in Suriname.** [On the green Scale (*Coccus viridis*) of Liberian Coffee in Surinam.] **De boorrups der kokospalmen** (*Castnia daedalus* **Cr.) in Suriname.** [The Coconut Borer Caterpillar (*C. daedalus*) in Surinam.]—*De Indische Mercuur*, 13th, 27th November & 25th December 1929, reprint 67 pp., 15 figs., 17 graphs. Amsterdam, 1929. (With Summaries in English.) [Recd. 1930.]

Following previous work on *Selenothrips* (*Heliothrips*) *rubrocinctus*, Giard, on cacao in Surinam [*R.A.E.*, A, x, 279], observations on the influence of weather on it were made in 1921–24. The results, which are discussed in detail, indicate that the thrips becomes abundant during periods of drought with much sunshine. When its numbers rise to an average of 1 adult per leaf, many of the leaves become rusty, but defoliation is not usually serious until the average is 2 adults per leaf.

Coccus (*Lecanium*) *viridis*, Green, is rather common in young coffee plantations in Surinam. It is seldom found in old ones, and infestation in them is usually localised, but may sometimes cause the loss of the entire crop. The Coccids were observed to attack new shoots put forth by stumps remaining after infested bushes had been cut down and burnt, and in another field spraying with tar distillate only kept the bushes free from infestation for a few weeks after each treatment. Ants, usually *Cremastogaster* sp., were thought to be responsible for these reinfestations, and when adhesive bands were applied, the bushes remained uninfested until the banding was removed, infested ones becoming free from the scales. The ants attending *C. viridis* sometimes nest in the ground and sometimes occur in the nests of other ants (*Dolichoderus*) found on the coffee bushes. In the latter case the nests can be removed. A Coccinellid was observed to be predacious on *C. viridis*, but no Hymenopterous parasites of the scale have been found in Dutch Guiana, and none seems to have been recorded from tropical America. The fungus, *Cephalosporium lecanii*, appears to infest only dead or dying scales.

Coconuts are an important crop only in the one district of Surinam. Next to bud-rot, *Castnia daedalus*, Cram., all stages of which are described, is the chief pest of the palm. The eggs are laid at the base of the leaf-stalk, and the larvae bore first in the axils of the lower leaves and later in the stem, the mines usually measuring 1–3 ft., though one as much as 12 ft. long has been found. The palm may be killed if the borer approaches the growing point. The yellowing of the lower leaves and falling of young fruits indicate the presence of full-grown larvae. The cocoon is usually found in the stalk or axil of the leaf, and is completed about 9 days before the pupa is formed; the pupal period lasts at least 40 days. No natural enemies were observed; Phorids of the genus *Megaselia* (*Aphiochaeta*) appear to breed in dead pupae only. Cutting out the caterpillars is the only control method in use, but is of little value as many escape detection.

PICKLES (A.). **Report on the Search in Jamaica for Parasites of the Sugar-cane Froghopper** (*Tomaspis saccharina* **Dist.**).—*Min. Proc. Froghopper Invest. Comm. Trinidad & Tobago,* pt. xix, pp. 145–149, 4 refs. Trinidad, 1930.

From investigations made in Jamaica, it is considered unlikely that there is in that Island any natural enemy of froghoppers that could advantageously be introduced into Trinidad against *Tomaspis saccharina,* Dist. The only one discovered was a Syrphid predator, which is apparently of very local distribution.

PICKLES (A.). **Notes on biological Studies on the Froghopper during the dry Season, 1930.**—*Min. Proc. Froghopper Invest. Comm. Trinidad & Tobago,* pt. xix, pp. 150–157. Trinidad, 1930.

During biological studies on the sugar-cane froghopper [*Tomaspis saccharina,* Dist.] in Trinidad during the dry season in 1930, a method was devised for isolating eggs in soil by passing a dry soil sample successively through sieves of 30-, 50- and 70-mesh. The eggs were thus concentrated in a soil sample of about one-sixth of the original bulk. Investigation proved that the removal of cane stumps from the field has little or no value. Tests in the field suggested that eggs were very much more numerous in clay than in marl soils. A few of the eggs obtained from soil were parasitised by *Lathromeris* sp. and *Anagrus* sp. Some eggs were found to be attacked by fungi, of which *Penicillium* sp. apparently attacks eggs in the field, *Acrothecium* occurring only in culture dishes.

THOMAS (C. A.). **A Review of Research on the Control of Wireworms.** —*Bull. Pennsylvania Agric. Expt. Sta.,* no. 259, 52 pp., 1 pl., 12 pp. refs. State College, Pa., July 1930.

Injury by Elaterid larvae seems to be generally increasing in recent years, and they cause an annual loss of wheat in Saskatchewan and Alberta amounting to several million dollars. In Pennsylvania, the most injurious species are *Pheletes agonus,* Say, which destroys chiefly seeds, seedlings and growing root crops, and *Agriotes mancus,* Say, and *Melanotus* spp., which attack mainly maize, wheat, tobacco and potatoes.

This bulletin constitutes a valuable review of all aspects of wireworm control, the published results obtained with each method by a large number of workers in various parts of the world being briefly indicated, with references to the extensive bibliography appended, showing the papers from which the information was obtained.

LIGHT (S. F.), RANDALL (M.) & WHITE (F. G.). **Termites and Termite Damage, with preliminary Recommendations for Prevention and Control.**—*Circ. California Agric. Expt. Sta.,* no. 318, 64 pp., 49 figs., 8 refs. Berkeley, Cal., August 1930.

This circular is a revision and amplification of an earlier one [*R.A.E.,* A, xvii, 730]. The Termite Investigations Committee, which has supplied the material for both circulars, is still carrying on research, and in the present publication presents in a general and non-technical form additional data concerning the termites of California, and tentative

suggestions regarding the most satisfactory methods as yet discovered for the prevention and control of termite damage to timber. The method of blowing poisonous dust into the tunnels by means of a dust-gun is described. Paris green, finely ground sodium fluosilicate powder or finely divided white arsenic (arsenical smelter dust) may be used with success; the last-named is the most rapid in killing the termites.

A section of the circular deals with the prevention of termite attack in buildings by constructional methods, various plans being described and illustrated with diagrams.

Legislation passed in California in 1929 requires all persons engaged in the State in repairing structures damaged by termites to be qualified and to receive a certificate issued by the Agricultural Commissioner of the county in which the work is done.

ALDEN (C. H.). **Peach Insects and Diseases and how to control them.** —*Bull. Georgia St. Bd. Entom.*, no. 71, 31 pp., 14 pls. Atlanta, Ga., January 1930. [Recd. December 1930.]

An account is given of the chief pests and diseases of peaches in Georgia, with instructions for their control. *Conotrachelus nenuphar*, Hbst. (plum curculio), *Aegeria exitiosa*, Say (peach tree borer), *Cydia* (*Laspeyresia*) *molesta*, Busck (oriental fruit moth) and *Aspidiotus perniciosus*, Comst. (San José scale) are estimated to cause more than 90 per cent. of the loss due to insects. A summarised schedule of remedial measures against these pests is given, with instructions for carrying them out and for the preparation of the various insecticides.

Minor pests, on which brief notes are given, are *Scolytus rugulosus*, Ratz. (shot-hole borer), *Aegeria pictipes*, G. & R. (lesser peach borer), *Anarsia lineatella*, Zell. (peach twig borer), *Heliothis obsoleta*, F. (corn ear worm), the larvae of which sometimes migrate from vetch and attack the green fruit, and various grasshoppers. Parasites of *Aspidiotus perniciosus* are *Aphelinus fuscipennis*, How., *A. mytilaspidis*, LeB., *Aspidiotiphagus citrinus*, Craw, and *Prospaltella aurantii*, How. *Chilocorus bivulnerus*, Muls., is an important predator, and the fungi, *Sphaerostilbe coccophila* and *Myriangum duriaei*, attack many of the scales. The eggs of *Conotrachelus nenuphar* are parasitised by *Anaphoidea conotracheli*, Gir., and the larvae by *Triaspis curculionis*, Fitch. The egg-parasite, *Telenomus quaintancei*, Gir., is one of the few enemies of *Aegeria exitiosa*, and *Trichogramma minutum*, Riley, and *Macrocentrus ancylivora*, Rohw., attack *Cydia molesta*.

O'KANE (W. C.), WESTGATE (W. A.), GLOVER (L. C.) & LOWRY (P. R.). **Surface Tension, Surface Activity, and Wetting Ability as Factors in the Performance of Contact Insecticides. Studies of Contact Insecticides i.**—*Tech. Bull. New Hampshire Agric. Expt. Sta.*, no. 39, 44 pp., 3 figs., 10 charts, 36 refs. Durham, N.H., February 1930.

In this progress report, the suggestions given are only tentative, in that more experiments are required. The apparatus used for discharging the liquids, the methods employed in determining their effect on the insects used in the tests, and other laboratory technique are described. Statements and equations are given to indicate the balance of forces prevailing when a liquid comes into contact with a

solid. Studies of sodium oleate solutions are described, including measurements of surface tension, angle of contact and the changes in values that occur when freshly prepared solutions are allowed to stand for varying lengths of time. The terms adhesion and cohesion in respect of the penetrating properties of contact insecticides are defined, and experiments to test the value of liquids in this connection are described, the results being summarised in tables.

O'Kane (W. C.) & Conklin (J. G.). **Lime Sulphur in Relation to San Jose and Oyster Shell Scales. Studies of Contact Insecticides ii.**—*Tech. Bull. New Hampshire Agric. Expt. Sta.*, no. 40, 15 pp., 8 figs., 14 refs. Durham, N.H., May 1930.

The following is the authors' summary :—Lime-sulphur sprays were able to effect good wetting of the bark of apple, plum, poplar, and sour cherry, and excellent wetting of black currant. The same sprays gave only a moderate angle of contact on the covering of San José scale [*Aspidiotus perniciosus*, Comst.] and oyster shell scale [*Lepidosaphes ulmi*, L.]. The angle of contact on the exposed integument of San José scale was high. The angle of contact and degree of wetting of lime-sulphur were approximately the same as those of distilled water. Lime-sulphur sprays were not found to penetrate the waxy scale covering. Only in rare instances did the sprays creep beneath the margin of the scale. The surface tension of lime-sulphur solutions is approximately the same as that of distilled water. It is not appreciably altered when exposed to the atmosphere. Lime-sulphur solutions remained distinctly alkaline for 18 to 24 hours.

Hydrogen sulphide is evolved from lime-sulphur solutions for a few hours after application of the sprays. Evolution practically ceases within six hours. Hydrogen sulphide in the amount evolved from lime-sulphur sprays cannot be considered as sufficient to account for their toxic action on San José scale or oyster shell scale. Young oyster shell scale withstood higher concentrations than could be liberated from lime-sulphur sprays as applied to trees. No trace of sulphur dioxide was found. Chemical tests gave no indication of the presence of sulphides in the bodies of the scale insects exposed to the vapours of lime-sulphur, but the significance of this is questioned.

Hamner (A. L.). **Dusting Sulphur for the Control of Cotton-leaf Bugs.**—*Circ. Mississippi Agric. Expt. Sta.*, no. 86, 4 pp., 4 figs. A. & M. College, Miss., December 1929. [Recd. 1930.]

A brief account is given of preliminary experiments conducted in 1929 in Mississippi against *Lygus pratensis*, L., *Psallus seriatus*, Reut., and *Adelphocoris rapidus*, Say, which for several previous seasons had caused injury to cotton by killing the small squares. The results show that two applications of a 300-mesh sulphur dust, at the rate of 10–15 lb. to the acre, made at or before the time that 20–30 per cent. of the young squares are being killed, gave an average increase of 275 lb. of seed cotton to the acre. This increase on the different plots dusted was evidently more affected by the ability of the plants to retain the fruit set than by the intervals at which the dust was applied. Plots dusted the second time on the fifth day had the lowest percentage of productive plants, whereas those dusted the second time

on the tenth day had the highest. Both the production and the percentage of productive plants indicate that the dust applied at a ten-day interval was as effective as that applied at a five-day interval.

PORTIER (P.). **Symptômes de l'empoisonnement par la nicotine chez les Lépidoptères.**—*C.R. Soc. Biol.*, cv, no. 30, pp. 367–369. Paris, 14th November 1930.

Experiments are described in which nicotine solution was applied to the tips of the antennae and wings of butterflies in order to study its effect on the nervous system. The action, which is convulsive, seems to be localised in the ganglia of the central nervous system, poison applied to the antennae affecting the cerebral ganglia first. The toxic action is proportionately greater as the temperature is higher.

Entomological Branch.—*Rep. Minist. Agric. Canada 1928–29*, pp. 116–138. Ottawa, 1929. [Recd. December 1930.]

The more important outbreaks of insects recorded in this report have been noticed from other sources. Insects discovered for the first time in Canada during the year were *Exoteleia dodecella*, L., which attacks pine buds, and *Batodes angustiorana*, Haw., on yew [*R.A.E.*, A, xviii, 380]. Notes are given on the introduction and liberation of parasites for the control of the European corn borer [*Pyrausta nubilalis*, Hb.] ; the species recovered in the field included *Microbracon brevicornis*, Wesm, [*cf. R.A.E.*, A, xviii, 118]. Experiments on breeding and liberation of *Trichogramma minutum*, Riley, against the oriental peach moth [*Cydia molesta*, Busck] gave promising results. *Mesoleius tenthredinis*, Morl., a parasite of the larch sawfly [*Lygaeonematus erichsoni*, Htg.], has been transferred to localities where outbreaks of the sawfly are occurring. The special problems dealt with at the various field laboratories are outlined.

Canadian Forest Insects.—*Spec. Circs. Canada Dept. Agric., Div. For. Insects*, [no. 1] 4 pp., 1 pl. ; [no. 2] 4 pp., 1 pl. ; [no. 3] 3 pp., 1 pl. ; [no. 4] 3 pp., 1 pl. Ottawa, July 1930.

These circulars, which contain information on distribution, nature and appearance of injury, bionomics and control, are the first of a series to be issued by the Canadian Department of Agriculture with the object of developing an intelligence service through which it will be possible to detect incipient outbreaks of forest insects, probably in co-operation with the present system of fire protection and without additional expense. For the present the plan consists of an organised educational campaign to be carried out mainly through the distribution of appropriate literature, with a co-ordinated system of reporting on forest insects. The first, third and fourth circulars are by J. M. Swaine and deal respectively with the eastern spruce bark-beetle (*Dendroctonus piceaperda*, Hopk.), the hemlock looper (*Ellopia fiscellaria*, Gn.), and *Tortrix* (*Cacoecia*) *fumiferana*, Clem. (spruce budworm); and the second, by M. B. Dunn, is on sawyer beetles [*Monochamus* spp.] in pine, spruce and balsam. It is intended to distribute these circulars among men working in the woods, together with instructions for making out reports.

Complete Research Program. European Corn Borer. 1930. United States and Canada.—63 pp. multigraphed. Washington, D.C., U.S. Dept. Agric. Bur. Ent. [1930.]

This programme outlines the work proposed to be undertaken during 1930 in connection with the European corn borer [*Pyrausta nubilalis*, Hb.] by the Entomological Branch of the Department of Agriculture of Canada, the United States Bureau of Entomology and associated Bureaux and the individual States concerned.

Miles (H. W.). **The Fluted Scale, *Icerya purchasi* Maskell.**—*Northw. Nat.*, v, no. 4, pp. 229–230, 1 pl., 3 refs. Arbroath, December 1930.

Icerya purchasi, Mask., was found to have become established on *Acacia hanburyana* in a greenhouse near Chester. Measures were taken to exterminate it.

Humphries (S.). **Pests in Wheat and its Products.**—*Pamph. Nat. Joint Ind. Council Flour-Milling Industry*, Tech. Educ. Ser., no. 5, 36 pp. London, January 1930. Price 6*d*.

The bulk of this pamphlet is devoted to a review of methods of controlling pests of stored wheat and its products, particularly by means of fumigants, air-tight storage, and heat. Brief popular notes are also given on the insects and mites infesting wheat in Britain and some of their natural enemies.

Morley (C.). **Clothes Moths' Parasite.**—*Trans. Suffolk Nat. Soc.*, i, pt. 2, p. 101. [Monks' Soham, Suffolk], December 1930.

The Ichneumonid, *Polyclistus mansuetor*, Grav., was obtained from *Tinea pellionella*, L., in Suffolk; it does not appear to have been previously recorded from this host.

Feytaud (J.). **Sur *Dioryctria splendidella* nuisible au pin maritime.**—*Rev. Zool. agric. appl.*, xxix, no. 4, pp. 53–57, 1 pl., 9 refs. Bordeaux, April 1930.

Injury has been caused during the past ten years to young plantations of *Pinus maritima* in south-western France by *Dioryctria splendidella*, H.-S., the larvae of which bore horizontal or oblique galleries that almost or entirely encircle the trunks, and finally cause the upper parts of the trees to wither. They have been recorded on various pines in Spain, Germany and Switzerland [*cf.* *R.A.E.*, A, xiii, 103; xiv, 374], but have not apparently been previously observed on *P. maritima*. The moths, which are briefly described, appear in June or July, and the larvae live from the summer until the following spring, when they pupate at the end of May in the clots of resin exuding from their entrance holes [*cf.* next paper]. Pines 4–8 ins. in diameter are most frequently attacked, almost always at the level of a branch whorl, the injury often starting in the scar of a lopped branch. The flow of sap is interrupted, both bark and bast being cut through, and the tree is liable to be broken off by the wind at the point attacked. The presence of a larva can be detected by a reddish tinge in the mass of

resin marking the entrance hole. These holes are found in the centre of the viscous clot, which may be as large as the fist where several larvae are at work, separated from it by a silky web. The Braconid, *Macrocentrus abdominalis*, F., was found to occur in considerable numbers as a parasite of this moth in the Gironde. A large number of pupae could be destroyed by the systematic removal of resin clots in the spring, or the moths might be attracted to light traps.

DE SANDT (—). **Sur trois Microlépidoptères du genre** *Dioryctria* (*splendidella, abietella, mutatella*).—*Rev. Zool. agric. appl.*, xxix, no. 4, pp. 57–63, 1 pl., 1 ref. Bordeaux, April 1930.

The three species of *Dioryctria* occurring in France, *D. splendidella*, H.-S., *D. abietella*, Schiff., and *D. mutatella*, Fuchs, have hitherto been much confused. The moths are briefly described, and various descriptions of the larvae, which appear to be indistinguishable, are quoted from the literature. The young larvae of *D. splendidella* differ so widely from the older ones that they have been mistaken for those of a distinct species. *D. splendidella* is, however, the only one of the three species that lives within the tree, feeding on the woody substance and not on resin or the seeds in the cones as has been often suggested. *D. abietella* and *D. mutatella* both live in the cones and destroy the seeds, the moths being easily distinguishable by size and colour, but adults of *D. abietella* closely resemble those of *D. splendidella*, thus giving rise to the erroneous belief that both species lived indifferently in the stems and cones. Further details are given of the damage caused by *D. splendidella* [see previous abstract]. The injury apparently starts almost invariably in scars left after lopping or tapping for resin. It would appear that the larva does not bore through the solidified resin and that pupation takes place in the open end of the gallery, only old pupal cases being found in the resin clots from which the moths would be unable to escape. *D. mutatella* has been recorded with certainty only from *Pinus sylvestris* and *P. maritima*, but *D. abietella* seems to occur on various species of *Abies*, *Picea excelsa*, *Pinus strobus*, and, rarely, *P. sylvestris*.

PAILLOT (A.). **Les traitements insecticides et anticryptogamiques des noyers.**—*C.R. Acad. Agric. Fr.*, xvi, no. 26, pp. 885–889. Paris, November 1930.

Experiments carried out near Grenoble in 1930 showed the methodical spraying of walnut trees against insects and fungi to be practicable, provided that a power sprayer is employed. The best results were secured with a Bordeaux mixture containing 1 per cent. copper sulphate and 1 per cent. lime with the addition of 0·5 per cent. calcium arsenate, for which lead arsenate might be substituted. The first application should be made not later than the first half of June and should be followed by two other applications at fortnightly intervals. The use of lime-sulphur and calcium arsenate caused serious scorching ; trees so treated were completely defoliated when examined on 8th October. The effect of the treatments on *Cydia* (*Carpocapsa*) [*pomonella*, L.] was difficult to determine owing to unfavourable weather and an attack by moths that had matured on neighbouring untreated trees, and the reduction of the percentage of nuts containing larvae from 40 on untreated to 30 on treated trees probably fails to indicate

the exact degree of control. The use of corrugated cardboard bands is recommended as an auxiliary measure. These should be fixed in August and left on the trees until May in order to allow any parasites developing among the larvae to escape. Treatment with sulphur, employed by some growers to whiten the nuts, also kills any larvae developing in them when applied immediately after harvesting. A winter treatment with mineral oil emulsion in Bordeaux mixture is recommended every two or three years.

FRIEDERICHS (K.) & STEINER (P.). **Wie man sich einfache Thermostaten selbst herstellen kann.** [The Construction of simple home-made Thermostats.]—*Anz. Schädlingsk.*, vi, no. 11, pp. 125–128, 6 figs. Berlin, 15th November 1930.

The construction is described of simple and cheap home-made electrical thermostats. The actual chamber is above the heating compartment and below the cooling compartment. Ice is used for cooling and a resistance for heating. The temperature is regulated by a toluol-mercury regulator.

EIDMANN (H.). **Beobachtungen im bayrischen Forleulengebiet.** [Observations in the Bavarian Pine Moth District.]—*Anz. Schädlingsk.*, vi, no. 11, pp. 129–135, 4 figs. Berlin, 15th November 1930.

A severe outbreak of *Panolis flammea*, Schiff., occurred in 1930 in the Bavarian state forest south of Nuremberg. Many stands of pines were completely defoliated, and spruces growing among them were sometimes attacked, but much less severely. Oviposition occurs only on trees older than about twenty-five years, but young stands were attacked by larvae migrating from adjacent defoliated trees. In loose sand, trenches or even wheel-ruts prevented this migration, but in firm soil, trenches were easily crossed. Most of the larvae in the ground-litter were parasitised by Tachinids, particularly *Ernestia rudis*, Fall., and Ichneumonid parasites also occurred. Predacious enemies included *Calosoma sycophanta*, L., *Cicindela hybrida*, L., the sand-wasp, *Ammophila sabulosa*, L., and the red forest ant, *Formica rufa*, L., and a fungus infection due to *Empusa aulicae* appeared to be developing to a considerable extent. An arsenical dust was applied on part of the infested area and proved effective when it was used early enough and was not washed off the trees by rain.

SPRENGEL (L.). **Der Erdbeer- oder Himbeerstecher** (*Anthonomus rubi* **Herbst**). [The Strawberry or Raspberry Weevil, *A. rubi*.]—*Anz. Schädlingsk.*, vi, no. 11, pp. 135–136. Berlin, 15th November 1930.

Reference is made to observations on *Anthonomus rubi*, Hbst., and its control in Sweden [*R.A.E.*, A, xviii, 694]. In Germany, insecticides are now largely used instead of collecting the weevils, but it is suggested that this can prove a valuable supplementary measure with suitable apparatus such as a wide shovel with a semicircular piece cut out of the front edge. By slipping the shovel under the plants and shaking them, tens of thousands of weevils can be collected in a quarter of an hour.

WAGNER (A. C. W.). **Schlupfwespen und ihre Wirte. Zuchtergebnisse von Hamburger Entomologen.** [Hymenopterous Parasites and their Hosts. Breeding Results obtained by Hamburg Entomologists.]—*Verh. Ver. naturw. Unterhaltung Hamburg*, xx (1928), reprint 17 pp. Hamburg, 1929. [Recd. 1931.]

A list is given of the parasitic Hymenoptera bred, arranged under their hosts, most of them having been collected in the Lower Elbe region, North Germany.

SCHNAUER (W.). **Das Schadgebiet der Tipuliden in Deutschland.** [The Area of Injury by Tipulids in Germany.]—*Z. wiss. InsektBiol.*, xxv, no. 6–7, pp. 113–129, 3 maps, 3 charts, 25 refs. Berlin, 31st October 1930.

Tipulids occur throughout Germany, but are injurious only in the North Atlantic climatic zone, where the winters are mild, the summers cool, and the rainfall heavy. Excess of moisture in September causes an extension in the area of injury in the following year, but only results in an intensification of the injury in the centre under certain conditions. Winter temperatures are of little value for the prediction of injury.

VOIGT (G.). **Ueber** *Ceuthorrhynchus contractus* **Marsh. als Schädling kultivierter Cruciferen, besonders des Goldlacks, nebst Bemerkungen zur Phänologie und Gradation kaltbrütiger Insektenarten.** [*C. contractus* as a Pest of cultivated Crucifers, particularly Wallflowers, with Notes on the Phenology and Abundance of Insects active in Winter.]—*Z. PflKrankh.*, xl, no. 11, pp. 492–505, 6 figs., 10 refs. Stuttgart, November 1930.

As a result of the mild winter, overwintered leaves of wallflower (*Cheiranthus cheiri*) at Geisenheim am Rhein were mined by the larvae of *Ceuthorrhynchus contractus*, Mshm., as early as March 1930. These leaf-mines are described in detail. A number of wild plants were also attacked.

BRASSLER (K.). **Ist** *Coccinella septempunctata* **L. wirklich nur Blattlausfresser?** [Is *C. septempunctata* really a Feeder on Aphids only?]—*Z. PflKrankh.*, xl, no. 11, pp. 511–513, 2 figs. Stuttgart, November 1930.

Though *Coccinella septempunctata*, L., feeds almost exclusively on Aphids, the author's observations on young oaks and *Salix fragilis* indicate that it may occasionally attack the leaves.

VON TUBEUF (C.). **Schutz vor der Einschleppung von Nadelholzschädlingen mit den Samen.** [Protection against the Introduction into Germany of Pests of Conifers in Seeds.]—*Z. Pfl Krankh.*, xl, no. 11, pp. 521–526, 6 figs., 5 refs. Stuttgart, November 1930.

The author emphasises the importance of regulating traffic in conifer seeds in Germany in order to prevent the introduction or spread of pests infesting them. Among the most dangerous of these are the Cecidomyiids, *Plemeliella abietina*, Seitner, in *Picea excelsa*, and *Resseliella piceae*, Seitner, in *Abies pectinata*; the Torymids, *Megastigmus*

abietis, Seitner, and *M. pictus*, Först. (*strobilobius*, Ratz.), in *P. excelsa*, *M. spermatotrophus*, Wachtl, in *Pseudotsuga taxifolia* (*douglasi*), *M. pinus*, Parf., in *Pinus sylvestris*, *M. wachtli*, Seitner, in *Cupressus sempervirens*, and *M. piceae*, Seitner, in *A. pectinata*; *Lonchaea viridana*, Mg., in *A. pectinata*; and the Anthomyiid, *Phorbia* (*Chortophila*) *laricicola*, Karl, in *Larix europaea*.

RUEDIGER (E.). **Schädlingsbekämpfung mit Arsen.** [Control of Pests by Arsenic.]—*Ent. Rdsch.*, xlviii, no. 1–2, pp. 11–14. Stuttgart, January 1931.

The author considers that aeroplane dusting with arsenicals against forest pests is undesirable, on account of the potential danger to other wild life, including bees.

HASE (A.). **Ueber einen Durchgasungs-Grossversuch mit Aethylenoxyd $CH_2—O—CH_2$.** [On an extensive Fumigation Experiment with Ethylene Oxide.]—*Z. Desinfekt.*, xxii, no. 10, pp. 675–697, 2 figs., 5 refs. Dresden, October 1930.

Following laboratory experiments in 1929, an extensive test with ethylene oxide was made at Koblenz, an empty building of over 127,000 cu. ft. of space, with a tower, being fumigated for 24 hours in January 1930 with a total amount of about 70 pints. The fumigant was applied on the four floors of the building and on the floor of the tower above it, but not on the three higher floors of the tower, as it was desired to test the upward spread of the gas. Mice and guineapigs were used to test its effect, as well as eggs and larvae of *Ephestia* [*kühniella*, Zell.], adults of *Calandra* [*granaria*, L.] and *Tribolium*, eggs, larvae and adults of *Cimex* [*lectularius*, L.], and nymphs and adults of *Tyroglyphus*. The average temperature was 4–5° C. [39·2–41° F.]. All the Arthropods were eventually killed on all floors, but immediate mortality was only obtained on the treated floor of the tower and with eggs of *Ephestia* and *Cimex* on some of the lower floors. *Calandra* and *Tyroglyphus* were the most resistant, and the fumigant was more effective on the upper treated floors. The mice were killed on all the floors. The differences in action observed indicate a certain stratification of the gas, and the concentration (0·5 volume per cent.) was clearly near the minimum in the existing conditions. These data agree with those obtained in the laboratory, in which also insects sometimes appeared to be uninjured by the fumigant, but died 1–2 days later.

BEUSCH (—). **Blausäureentwesungen der städtischen Desinfektionsanstalt in Königsberg i. Pr.** [Fumigation with Hydrocyanic Acid Gas at the Civic Disinfection Institute at Königsberg, Prussia.]—*Z. Desinfekt.*, xxii, no. 11, pp. 723–725, 1 fig. Dresden, November 1930.

A description is given of a fumigation chamber in which hydrocyanic acid gas, produced by Zyklon B, is used to free furniture, etc., from such pests as clothes moths.

Fulmek (L.). **Neue Erfahrungen über die Bekämpfung des Apfelblattsaugers.** [New Experiences in the Control of the Apple Leaf Sucker.]—*Mitt. Bundesanst. PflSchutz Wien*, no. 199, 10 pp. Vienna, 1930.

An account is given of the measures adopted in the Upper Inn valley, Austria, against the apple leaf sucker [*Psylla mali*, Schm.]. They only differed in a few details from those worked out in Germany [*R.A.E.*, A, xvii, 484, etc.]. The Psyllid can be kept controlled by a liberal annual application in spring, just before the buds swell, of 8–10 per cent. fruit-tree carbolineum.

Robek (A.). **Muchnice dubnová** (*Bibio marci* **L.**).—*Ochr. Rost.*, x, no. 3, pp. 73–74. Prague, 1930.

In the spring of 1930, considerable damage was caused to sprouting cereals in central Czechoslovakia by the larvae of *Bibio marci*, L., large numbers of which were present just below the surface of the soil. Brief descriptions of the larvae and adult flies are given. The female lays large numbers of eggs in the cattle manure on the soil, and the young larvae first feed in the decaying matter and then attack the rootlets of cereals. Pupation was observed in May. The chief damage is done in spring, as the plants attacked in summer and autumn are more resistant.

The following control measures are recommended: deep ploughing in autumn; rolling the fields in spring; the use of artificial instead of natural manures; letting poultry feed on the larvae in the infested fields; and treating the soil with a mixture of kainit and nitrogenous lime, 6 : 1, after which the field should be harrowed, rolled and then again harrowed. Slices of potato placed on end in the soil are very effective baits; numerous larvae gather on them within 3–4 days, after which they should be removed and thrown into hot water.

Constantineanu (M. I.). **Contribution à la faune ichneumonologique de la Roumanie.**—*Ann. sci. Univ. Jassy*, xiv, no. 3–4, pp. 511–524, 2 refs. Jassy, February 1927.

Constantineanu (M. I.). **Nouvelle contribution à la faune ichneumonologique de la Roumanie.**—*Op. cit.*, xv, no. 1–2, pp. 213–247. February 1928.

Constantineanu (M. I.). **Contributions à l'étude des Ichneumonidés en Roumanie.**—*Op. cit.*, xv, no. 3–4, pp. 387–642, 18 figs., 7 pp. refs. March 1929.

In these three papers lists are given of over 400 Ichneumonids from Rumania, including some new ones, with notes on their distribution and biology and hosts when known.

Hergula (B.). **Ueber die Mortalität der Eier und jungen Raupen von** *Pyrausta nubilalis* **Hb.** [On the Mortality of the Eggs and young Larvae of *Pyrausta nubilalis*, Hb. (*In Serbian.*)]—*Acta Soc. ent. jugoslav.*, iii–iv (1928–29), fasc. 1–2, pp. 44–60, 16 refs. Belgrade [1930]. (With a Summary in German.)

Observations were carried out in 1929 in the laboratory and in maize fields near Zagreb to determine the percentage of eggs and larvae of

Pyrausta nubilalis, Hb., that survive the various factors responsible for mortality among them. Plants were artificially infested by moths in gauze cages [*R.A.E.*, A, xviii, 149]. In late June and early July, 160 batches of eggs were deposited, of which 50, containing in all 1,324 eggs, were kept under observation. Of these only 873 eggs (65·9 per cent.) hatched. Nine varieties of maize in adjoining plots were infested with about 4,000 newly hatched larvae by transferring them with a fine brush between the 14th and 22nd July. A considerable number migrated to neighbouring uninfested maize plants; in many instances young individuals were blown over by the wind while they were descending from the plant on a silken thread. In September all the nine varieties of maize were injured to approximately the same extent, and the mortality of the larvae was about the same on each, amounting to 72 per cent.

The literature on the causes of mortality among the eggs and young larvae is briefly reviewed [xiv, 270; xv, 41, 666; xvii, 211, 214; etc.]. In 1929, about 3 per cent. of the eggs were unfertilised; some were killed by the sun, hardly any hatching in batches deposited on the upper surface of the top leaves and exposed to direct sunlight; and others were brushed off or injured by leaves blowing about in the wind. Some of the eggs were killed by unidentified fungi; about 16 per cent. were destroyed by the predacious mite, *Allothrombium* (*Trombidium*) *fuliginosum*, Herm.; and *Trichogramma evanescens*, Westw., parasitised some of the egg batches, two parasites emerging from each host egg. The ants, *Myrmica laevinodis*, Nyl., and *Lasius emarginatus*, Ol., attacked the larvae; and the latter, as well as the eggs, were destroyed by the predacious larvae of *Chrysopa vulgaris*, Schn., which were abundant at the end of July and beginning of August.

Poljugan (D.). **Beitrag zur Biologie der Blattlaus-Art** *Pterocallis juglandis* **v.d. Goot.** [Contribution to the Biology of the Nut Aphis, *Callipterus juglandis* v.d. Goot. (*In Serbian.*)]—*Acta Soc. ent. jugoslav.*, iii–iv (1928–29), fasc. 1–2, pp. 72–78. Belgrade [1930]. (With a Summary in German.)

Observations carried out from 1926 to 1929 on *Callipterus* (*Pterocallis*) *juglandis*, Frisch, in northern Jugoslavia, where it is a common pest of walnut (*Juglans regia*), showed that three forms occur in the course of its life-cycle, which is completed in a year, namely: alate viviparous parthenogenetic females, successive generations of which occur from May to September, alate males and apterous females, which lay the winter eggs. Each form is described. The parthenogenetic forms occur on the leaves (which blacken and shrivel) and develop in about a fortnight. Development is retarded in wet or cold weather, or during drought. Reproduction often ceases in July or August, if the weather is very hot and dry, and the Aphids disappear from the trees, but reinfest them immediately after the first abundant rain in September. At the end of the month two distinct types of nymphs occur: some are greenish yellow and develop into apterous oviparous females, while others are orange and develop into alate males. In October the fertilised apterous females migrate to the trunk of the tree, where each deposits one or two eggs in small cracks in the bark.

C. juglandis only occurs on *Juglans regia* and is usually of little importance in Jugoslavia, as the colonies are small and are not found

in dry summers, when the trees are weakened by the lack of sap. Considerable damage may, however, be caused in moderately wet summers.

[GRADOEVIĆ (M.).] **Градојевић (M.).** *Tettigometra hexaspina* **Klti., cicadelle nuisible au** *Papaver somniferum* **en Serbie du Sud.** [*In Serbian.*]—*Acta Soc. ent. jugoslav.*, iii–iv (1928–29), fasc. 1–2, pp. 97–102, 1 pl., 3 refs. Belgrade [1930]. (With a Summary in French.)

During the last few years *Tettigometra hexaspina*, Kolen., has been causing considerable damage to poppy, *Papaver somniferum*, in Southern Serbia, where this plant is extensively cultivated. Its synonymy and geographical distribution are briefly discussed, and the eggs, nymphs and adults are described. Observations in the summer of 1928 in poppy fields near the town of Veles and in the laboratory in Belgrade showed that in the second half of May the overwintered females deposit large batches of eggs on the main root of the plant at a depth of about 2 ins., or on the root collar, and sometimes at the base of the lower leaves. Many plants harbour several hundred eggs. The nymphs hatch in 7 days and require over 3 weeks to mature. They cause severe injury to the plants by sucking the juice from the stems, which dry up and wither, practically no yield of seed being obtained. The adults of the first generation appear in the beginning of July and do not remain on the poppy, but migrate to other unknown food-plants, on which following generations presumably develop. In one instance mature larvae of the second generation were found in July on the stem of one of the maize plants cultivated in the same field as the poppies.

BARANOV (H.). **Einige Worte über die** *Pyrausta*-**Tachinen.** [Remarks on the Tachinids that parasitise *Pyrausta nubilalis* Hb. (*In Serbian.*)]—*Acta Soc. ent. jugoslav.*, iii–iv (1928–29), fasc. 1–2, pp. 103–108. Belgrade [1930]. (With a Summary in German.)

Notes are given on the Tachinids, *Ceromasia juvenilis*, Girschn., *Zenillia roseanae*, Br. & Berg., *Z.* (*Exorista*) *mitis*, Mg., and *Nemorilla floralis*, Fall., which are parasites of the larvae of *Pyrausta nubilalis*, Hb., in Europe. The first two have been reared from this host in Jugoslavia.

C. juvenilis is the most important Dipterous parasite of *P. nubilalis*, but so little is known of its morphology that it has always appeared in the European and American literature under the name of *senilis*, Mg., Rond. [*cf. R.A.E.*, A, xviii, 440]. The hypopygia of the two species are similar, but they differ in colour and in certain morphological characters, and the adults appear at different times. Those of *C. senilis* occur in summer and those of *C. juvenilis* in spring, though the latter has also been obtained in the laboratory in late autumn. The little that is known of the biology of these flies refers exclusively to *C. juvenilis* and to breeding in laboratory. Characters for distinguishing the males of *C. juvenilis* and [*Lydella* ?] *stabulans*, Mg., are indicated; there appears to be no means of distinguishing the females with certainty [*cf.* xix, 71].

The characters differentiating *Z. roseanae* and allied species that occur in Jugoslavia are briefly discussed. A single female of *Z. mitis*

was observed by the author in Jugoslavia in April. *N. floralis*, of which *N. maculosa*, Mg., and *N. notabilis*, Mg., are considered to be aberrations, occurs all over the country; it is shown that it can be distinguished from *Meigenia majuscula*, Rond., to which it is very similar.

Vukasović (P.). **Sur la lutte contre la cochenille du prunier : *Lecanium corni* L. (pulvérisations durant l'été).** [*In Serbian.*]—*Acta Soc. ent. jugoslav.*, iii–iv (1928–29), fasc. 1–2, pp. 119–131, 1 ref. Belgrade [1930]. (With a Summary in French.)

A detailed account is given of experiments in June–November 1929 in Belgrade and Central Serbia to determine whether summer spraying is effective against *Lecanium corni*, Bch., on plum. In laboratory tests all larvae were killed by being dipped in various nicotine solutions or oil emulsions, but spraying the trees with nicotine in July and August only killed a negligible percentage of the larvae, owing to the fact that the hair covering the lower surface of the leaves, where most of the larvae sheltered, prevented the sprays from adhering and reaching them.

[Gradoević (M.).] **Градојевић (М.).** *Loxostege sticticalis* **L. and its Outbreak in eastern Jugoslavia.** [*In Serbian.*]—*Acta Soc. ent. jugoslav.*, iii–iv (1928–29), fasc. 1–2, pp. 132–139, 4 figs., 8 refs. Belgrade [1930].

Loxostege sticticalis, L., all stages of which are described, appeared for the first time in Jugoslavia in the autumn of 1929 when a severe outbreak occurred in September along the whole eastern frontier, serious damage being caused to vines, vegetables and fruit trees. It is probable that the moths migrated from Bulgaria [*cf. R.A.E.*, A, xviii, 226]. Outbreaks in Russia are briefly reviewed, and estimates of the losses caused in Czechoslovakia and Bulgaria are given.

Morris (H. M.). **A note on "Vromousa"** (*Dolycoris baccarum* **L.**).—*Cyprus Agric. J.*, xxiv, pt. 4, pp. 149–150. Nicosia, October 1929. [Recd. November 1930.]

Two Tachinids, one of which has been identified as *Gymnosoma rotundatum*, L., are reported from Cyprus as attacking *Dolycoris baccarum*, L.; on an average over 50 per cent. of these Pentatomids that were found sheltering during the summer under stones on a mountain [*cf. R.A.E.*, A, xviii, 4] were parasitised. Only on one occasion have two of the parasites been found in a single host. On reaching maturity the larva emerges from its host, probably causing its death in the process, and pupates on the ground. *Gymnosoma* is itself severely attacked in the pupal stage by at least two parasites.

[Grossheĭm (N. A.).] **Гроссгейм (Н. А.). The Appearance in Masses of injurious Insects.** [*In Russian.*]—*Bull. Mleev Hort. Expt. Sta.*, no. 26, 26 pp., 10 figs., 2 refs. Mleev, 1930. (With a Summary in English.)

The author discusses the main characteristic features of outbreaks of insect pests, namely, their periodicity and sudden appearance

and disappearance, and concludes that the presence or absence of food, meteorological conditions, activity of man, and biological factors do not play a decisive and constant part in the fluctuations of the numbers of insects. The relation between a host and its primary and secondary parasites is discussed at some length and explained by means of graphs and mathematical formulae. The author does not consider that the curve of abundance of parasites rises above that of the host at the end of an outbreak, and outlines a theory according to which the curves representing fluctuations in the abundance of parasites are always below that of the host, though approaching it most nearly when it falls.

The author considers that outbreaks depend on changes in the reproductive capacity of the female insects, which fluctuates from unknown causes with different generations within one or several consecutive years. The rate of egg production of the host is, however, always higher than that of the parasite.

Vayssière (P.). **Les insectes nuisibles au cotonnier dans les colonies françaises.**—*Faune Colon. françaises*, iv, fasc. 3, pp. 193–439, 18 pls., 57 figs., 17 pp. refs. Paris, Société d'Editions géogr. marit. colon., 1930. Price *Fr.* 60.

In addition to information contained in a work previously noticed [*R.A.E.*, A, xiv, 457], which is here revised and amplified, this monograph includes data gathered from reports from the various French colonies where cotton is cultivated, and forms a complete guide to the insects attacking cotton in these territories, together with the control measures employed against them. As a result of collating in a single work information on pests occurring in countries often widely separated, it has been possible to arrive at some conclusions regarding the problems of the biological or geographical races of certain insects.

Lesne (P.). **Coup d'oeil sur les principaux ennemis du cotonnier au Mozambique.**—*Rev. Bot. appl.*, x, no. 110, pp. 781–791. Paris, October 1930.

An account is given of the principal pests of cotton in the Zambesi region [*cf. R.A.E.*, A, xv, 562, 563, 564 ; xvi, 670], which include *Oxycarenus* spp., particularly *O. hyalinipennis*, Costa, *Dysdercus fasciatus*, Sign., *D. superstitiosus*, F., *Empoasca* (*Chlorita*) sp., *Earias insulana*, Boisd., *Diparopsis castanea*, Hmps., and *Apion* sp., a weevil that lives in the stems. *D. castanea* and *Dysdercus* spp. are considered to be the most injurious. Minor pests include *Heliothis obsoleta*, F. (*Chloridea armigera*, Hb.), *Tarache nitidula*, F., *Xanthodes graellsi*, Feisth., *Aphis gossypii*, Glov., *Zonocerus elegans*, Thnb., *Acrocercops bifasciata*, Wlsm., *Pyroderces simplex*, Wlsm., the Lamiid, *Tragiscoschema tenuicorne*, Thoms., which mines in the stem, though the injury is not apparent until the cotton is well-grown, and the Meloids, *Epicauta velata*, Gerst., and *Decapotoma catenata*, Gerst., and the Clytrid, *Antipa ruficollis*, Ol., which attack the flowers.

[France.] **Ministère de l'Instruction publique. Commission nationale d'Etude des Calamités. Une enquête sur les sauterelles.**—19 pp., 4 figs. Paris, Ass. Colon.-Sci., 1931. Price *Fr.* 3.

This is the French version of a questionnaire respecting locusts prepared by B. P. Uvarov and issued by the Imperial Institute of Entomology to its correspondents.

Jack (R. W.). **Locusts in Southern Rhodesia.**—*Rhodesia Agric. J.*, xxviii, no. 1, pp. 81–91, 4 refs. Salisbury, Rhodesia, January 1931.

An outline is given of the history of locust outbreaks in South Africa and of the biology of *Locustana pardalina*, Wlk. (brown locust) and *Nomadacris septemfasciata*, Serv. (red-winged locust), which are known to swarm and breed periodically in Southern Rhodesia. *Locusta migratoria migratorioides*, Rch. & Frm., entered the Colony from the east in 1923, but did not breed.

During the great outbreak of *Locustana pardalina*, which commenced in 1921, Southern Rhodesia, which appears to be only an overflow area, was invaded in 1922 and 1924 from Bechuanaland. The limiting factor in the spread of this species, which inhabits dry regions, appears to be humidity. According to observations made during the outbreak, there are two generations a year in the type of climate found in Southern Rhodesia. *N. septemfasciata* was present in the Colony from 1906 to 1909, when it was widespread in South Africa. The appearance of swarms of this species in north-western Rhodesia in 1930 constitutes a new record.

Primitive methods of preventing winged swarms from alighting on crops include the banging of tins, discharge of firearms and waving of brightly coloured flags, but smoke smudges, a formula for which is given, would probably be more effective.

Storey (H. H.) & McClean (A. P. D.). **The Transmission of Streak Disease between Maize, Sugar Cane and wild Grasses.**—*Ann. Appl. Biol.*, xvii, no. 4, pp. 693–719, 4 pls., 13 refs. Cambridge, November 1930.

The following is taken from the authors' summary: This paper describes experiments carried out in Natal during 1924–29 in the transmission of streak disease between maize, sugar-cane, *Digitaria horizontalis* and *Eleusine indica*, in which *Cicadulina* (*Balclutha*) *mbila*, Naudé, was the transmitting agent and was usually manipulated by the single-leaf cage method [*cf. R.A.E.*, A, xiv, 18; xvi, 335]. A considerable series of such experiments in the greenhouse and in the field, together with a large-cage experiment, indicated that the virus of maize streak is incapable of causing permanent infections of sugar-cane, and this conclusion is confirmed by field observations. The maize virus frequently caused transitory infections of Uba cane in the form of a few large chlorotic streaks on the leaves, from which the virus was re-transferred to maize. All evidence indicated that the cane plant made a complete recovery from this transitory infection and ceased to harbour the virus. The virus from Uba cane [xiii, 393] readily reinfected it, but when it was transferred to maize produced only a mild form of streak disease, distinguishable with certainty from

normal maize streak. Repeated passage of the cane virus through maize failed to enhance its virulence to the latter. Infection by the cane virus afforded no protection to maize, or to *C. mbila*, from infection by the maize virus.

Lists are given of cane varieties proved to be susceptible to streak disease, of those provisionally regarded as immune, and of species of wild grasses believed to contract the disease in the field.

In experiments, infective individuals of *C. mbila* survived the winter in the open at Durban and infected maize in the following spring. The infection of maize in the spring in Natal is thought to be caused usually by the survival of the virus in overwintering leafhoppers and not in perennial host plants.

No transmission of the disease was obtained with other insects taken from infected maize or sugar-cane, which included 21 species of Jassids and 4 species of Delphacids. Large-cage experiments with *Peregrinus maidis*, Ashm., and maize streak also gave negative results, which suggests that this disease is distinct from the disease of maize transmitted by this insect in Cuba [xvii, 420, 468].

MacGill (E. I.). **The Biology of Thysanoptera with Reference to the Cotton Plant. vi. The Relation between the Degree of Infestation and the Date of Planting.**—*Ann. Appl. Biol.*, xvii, no. 4, pp. 767–774, 4 graphs, 2 refs. Cambridge, November 1930.

Experiments were carried out in 1929 to determine the degree of infestation by *Thrips tabaci*, Lind., on cotton sown at different dates (28th March, 23rd April and 20th May) in pots containing light soil with hygroscopic moisture 2·53 per cent. and loss on ignition 12·2 per cent., or clay soil with hygroscopic moisture 2·60 per cent. and loss on ignition 10·6 per cent. The mean temperature of the glasshouse was 27° C. [80·6° F.] and the mean humidity 71 per cent. Infestation counts of the thrips were made at weekly intervals. In the light soil, the plants sown late in the season were more affected, the infestation being relatively high almost from their germination and causing death before the flowering stage was reached. On the plants sown earlier, the infestation was relatively low for a considerable period, and although at the end of the season the thrips became very numerous, it was not until after the bolls had been formed, and the damage done was small.

The plants sown in clay soil at different dates did not show such a marked difference in the degree of infestation, and all were less infested by the thrips than the corresponding blocks of plants in light soil. This corroborates the findings of previous experiments that plants grown in light soil are more heavily infested [*R.A.E.*, A, xviii, 331].

Miles (M.). **On the Life-history of** *Blastodacna atra* **Haw., the Pith Moth of the Apple.**—*Ann. Appl. Biol.*, xvii, no. 4, pp. 775–795, 2 pls., 3 figs., 44 refs. Cambridge, November 1930.

Blastodacna atra, Haw., all stages of which are described, is widely distributed in England and northern Europe and appears under some conditions to be a major pest of apple. The larvae destroy the shoots and blossom trusses, and the cracking of the bark that follows the injury to the twigs permits the access of fungi, particularly the apple

canker fungus, *Nectria galligena*. The injury is most apparent in the spring, about the time of blossoming. Considerable difference of opinion appears to exist as to the correct name of this moth ; Meyrick records it as *Chrysoclista vinolentella*, H.-S., and in Continental literature it is referred to as *Blastodacna putripenella*, Zell. Details are given of the methods by which studies of its life-history were carried out in England in 1928. The adults emerge during the latter part of July, and the eggs are laid singly on the twigs, usually near the base of the buds. The larvae, which hatch in 14–17 days, tunnel into the twigs, without first attacking the leaves, and feed continuously during the winter, weather conditions having no appreciable influence on their activities. The pupal stage lasts about a month, approximately from mid-June to mid-July.

Parasites reared included the Ichneumonids, *Pimpla inquisitor*, Scop., and *Ephialtes albispiculus*, Morley, the larvae of the latter being ectoparasitic on the host larvae, the Encyrtid, *Copidosoma woronieckae*, Now., which is polyembryonic, as many as 17 adults having been observed to emerge from one host larva, the Pteromalid, *Habrocytus* sp., *Bethylus fuscicornis*, Jur., and the Ichneumonid, *Hemiteles areator*, Panz., which is hyperparasitic, its host being probably *E. albispiculus*.

Records of the occurrence of the moth from 1855 onwards are given from the literature, and the varieties of apple chiefly susceptible are indicated. Bush trees and nursery stock seem to be particularly liable to attack. Previously recommended control measures are discussed in relation to the bionomics of *B. atra* as recorded in these investigations, which indicate that a lead arsenate spray in late summer would not be likely to give satisfactory results, since the larvae make their way under the bark almost immediately after hatching, and that winter spraying with tar distillates could not be relied upon, since the larvae remain at some distance from their entrance holes, which are minute, and cracks in the bark do not occur until March when the trees begin active growth and a tar-oil winter wash would be detrimental to the growing tissue. Hand picking and destroying of infested shoots appears to be the only suitable remedy suggested. The infested twigs should be collected in boxes covered with gauze, to allow the parasites to escape. Light traps might be used in the case of a serious local infestation to reduce the number of moths flying in the plantations. Since the larvae appear to leave dying wood, all prunings should be destroyed.

Burt (B. C.) & Dutt (G. R.). **The Desert Locust in India, 1929–1930.** —*Agric. J. India*, xxv, pt. 5, pp. 417–425, 1 pl., 1 map. Calcutta, 1930.

A great outbreak of the desert locust, *Schistocerca gregaria*, Forsk., began in September 1926 and assumed enormous proportions in July 1929, when the Punjab, the Punjab States, Sind, part of Rajputana and the United Provinces were invaded by large swarms of sexually mature locusts. The progeny of these migrated eastwards, probably beyond the limits of India. A still greater invasion, probably from Persia, which was, however, limited to Baluchistan and western and northern India, began in February 1930, and a fresh influx, which spread to Rajputana and the Central Provinces, occurred in May. In each case breeding took place. In August, swarms of sexually mature locusts

again made their appearance. The damage to crops was not great in 1930 and was largely confined to sugar-cane and cotton.

A special Locust Information Bureau for the purpose of receiving, collating and circulating locust reports from various parts of India and elsewhere was established on the recommendation of the Locust Committee of the Imperial Council of Agricultural Research, which has also sanctioned a research scheme for the study of the biology of this locust, and the efficiency and economy of various control measures.

The measures employed for locust control are briefly discussed [*cf.* *R.A.E.*, A, xix, 60] ; it was found that the flooding of oviposition areas is effective only when done a few days before the eggs hatch. Sodium fluosilicate was used as the insecticide in baits ; the action is a delayed one, the locusts dying in 12–72 hours. Its comparative harmlessness to stock has been demonstrated by special experiments. The use of aeroplanes for scouting purposes is considered to be less practical and economic than the employment of mounted scouts.

JEPSON (F. P.) & OTHERS. **Reports on Insect Pests in Ceylon during 1929.**—25 pp. [in] *Tech. Rep. 1929 Dept. Agric. Ceylon.* Colombo, 1930.

Some of the information contained in the reports of the Entomological Division and the Plant Pest Inspectors has been noticed from other sources [*R.A.E.*, A, xviii, 155, 558, 674 ; xix, 62]. There was no marked outbreak of any particular pest, and it appears probable that unseasonable weather affected the normal development of some of those that usually occur annually at definite seasons. Insects received for identification included : *Parasa lepida*, Cram., which had caused severe injury to coconuts on one estate ; *Phenacoccus* sp. on egg-plants (*Solanum melongena*) ; *Sylepta derogata*, F., on *Hibiscus esculentus* ; *Notolophus posticus*, Wlk., on dadap (*Erythrina lithosperma*) ; *Natada nararia*, Moore, on *Hydnocarpus wightiana* ; and *Lamprosema poeonalis*, Wlk., on pasture grass.

Investigations on the control of Limacodids (nettle grubs) on tea were continued [*cf.* xviii, 156]. Of the ten species of Hymenopterous parasites bred from the material collected, a Braconid attacking the larvae of at least four species was the most prevalent. Its life-cycle occupies about two weeks, thus enabling it to pass through at least two generations during the larval stage of its host. In experiments with sprays in the field, 50 per cent. mortality was obtained with 1 lb. soft soap to 8 gals. water. Sodium silicofluoride (1 lb. to 20 gals. water) and tobacco extract were not effective. *Narosa conspersa*, Wlk., which was first recorded as a pest of tea in 1928, was common in one locality. The eggs are deposited singly on the lower surface of the leaves, the average number laid by one moth being about 200. The egg, larval and pupal stages lasted 5–7, 28–38, and 18–22 days respectively. *Parasa lepida* was less abundant on tea. The eggs are laid in batches of 20–70, the average number deposited by one female being 533. The egg stage lasted 6–8 days, the larval 49–69, and the pupal 36–54. *Thosea cervina*, Moore, was the most abundant species, but attempts to breed it through its entire life-cycle were unsuccessful. Oviposition began two days after the emergence of the moths and was completed on the fifth day, a female laying on an average 80 eggs. The pupal period lasted 32–40 days.

Termites that are primary pests of plants of economic importance in the colony are discussed. New food-plant records, among which are some of undescribed species, include: *Coptotermes ceylonicus*, Holmgr., on coconut palms; *Calotermes* (*Neotermes*) *greeni*, Desn., on mango, *Artocarpus integrifolia*, dadap, etc.; and *C.* (*Glyptotermes*) *dilatatus*, Bugnion & Popoff, on guava and dadap. *Termes horni*, Wasm., a soil-nesting species that usually attacks dead wood, was found damaging *Canavalia ensiformis* and the unexpanded leaves of an ornamental palm. In investigations on the biology of termites, the winged forms were not produced in captivity, but apterous egg-laying forms of both *C.* (*N.*) *militaris*, Desn., and *C. dilatatus* were obtained within nine months of the hatching of the larvae. The method of controlling *C. militaris* on tea by introducing Paris green into the infested part of the plant is discussed [xviii, 105]. Notes are also given on termites injurious to buildings and building materials; pieces of Burma iron-wood (*Xylia dolabriformis*) placed in the nests of a number of subterranean species was not damaged. Preliminary experiments in the control of subterranean termites are described. Petrol, applied with a funnel into holes made in the nest ($1\frac{1}{2}$ oz. to each hole), resulted in the destruction of the entire colony. It should be introduced at about six different points, forming a circle with a radius of about 18 ins. from the centre of the nest, one application being also made in the centre where the ventilating aperture is generally situated. The holes should immediately be covered with loose soil, well trodden down.

Investigations in the Eastern Province, between 8th and 20th September, showed the chief parasites of *Nephantis serinopa*, Meyr., on coconut to be a Chalcid, similar to *Stomatoceras sulcatiscutellum*, Gir., which parasitises the pupae of this moth in south India, and a Braconid, probably *Apanteles* sp., attacking the larvae, the total rate of parasitism being only 4·14 per cent. Investigations on *Leptocoris varicornis*, F., made in view of the irregularity of infestation of rice that occurs in adjacent fields in the same or successive seasons, indicate that plants that flower before or after the main crop are liable to a severe and concentrated attack.

Pests recorded on new food-plants in the Southern Division were: *Rhaphidopalpa* (*Aulacophora*) *abdominalis*, F., on melons; *Aphis gossypii*, Glov., on *Hibiscus esculentus*; *Acanthopsyche subteralbata*, Hmps., on *Gliricidia maculata* and *Albizzia*; *Euproctis atomaria*, Wlk., on *Lagerstroemia indica*; *Apate submedia*, Wlk., on *Peltophorum ferrugineum*; and *Suana concolor*, Wlk., on roses.

CORBETT (G. H.). **An historical Note on *Tirathaba rufivena* Walk. (the greater Coconut Spike Moth) and its three Parasites in Malaya.** —[*Bull.*] *Dept. Agric. S.S. & F.M.S.*, Sci. Ser. no. 3, pp. 1–9, 18 refs. Kuala Lumpur, 1930.

The literature on infestation of coconut palms by Pyralids of the genus *Tirathaba* is reviewed. The species concerned in Malaya is *T. rufivena*, Wlk., which was previously recorded as *Tirathaba* sp. near *trichogramma*, Meyr. [*R.A.E.*, A, xv, 656, etc.]. The possibility of using its parasites for the biological control of *T. trichogramma* in Fiji is being considered [*cf.* xv, 640, xviii, 617]. The larval stage of *T. rufivena* lasts 2–3 weeks and the pupal stage 10–12 days. Of the

three parasites occurring in Malaya, the Ichneumonid, *Nemeritis palmaris*, Wlkn., appears to be eminently suitable for introducing into another country. The sexes occur in about equal numbers, and the parasite is very active. The larva emerges from the caterpillar after it has spun its cocoon, and itself pupates in a whitish cocoon. The life-cycle from egg to adult probably occupies about 24–26 days, the pupal period lasting 12–18. In confinement the adult usually lives about 6 days on sugar and has lived up to 11. The young larvae are especially attacked. It is therefore probable that the parasites would survive a journey of 33 days. The Tachinid, *Erycia* (*Hemimasicera*) *basifulva*, Bezzi, does not appear to be very numerous, but owing to its long pupal period and the possibility of keeping it alive about another 6 days on sugar, its transport might be possible. The pupal period is passed in the pupa of the host, and the period from the spinning of the cocoon of the caterpillar to the emergence of the parasite occupies 16–18 days. The Braconid, *Apanteles tirathabae*, Wlkn., attacks chiefly the younger larvae, and as its development is completed in 10 days and the adults of *Tirathaba* do not pair in confinement, there is little possibility of its introduction into another country, unless the cocoons are kept in a cold storage.

[CORBETT (G. H.).] **Entomological Notes. Third Quarter, 1930.**—*Malayan Agric. J.*, xviii, no. 10, pp. 511–513. Kuala Lumpur, October 1930.

An unidentified caterpillar damaging the fruits of oil-palm [*Elaeis guineënsis*] was recorded for the first time from one estate. Of 1,213 developed fruits in two bunches, 368 had a damaged pericarp, and of these 172 contained no kernel. Some kernels had been destroyed by the caterpillar, but the majority appeared to have been broken down by bacteria penetrating the hard shell. Fruits have been observed completely ringed round at the base by the caterpillar. Termites also caused some damage by working up through the trunk and destroying the bud. To prevent *Rhynchophorus schach*, Ol. (red-stripe weevil) ovipositing on surfaces exposed by pruning oil palms, care should be taken in disinfecting the cut-ends of petioles.

Further damage to coffee by *Stephanoderes* (*Cryphalus*) *hampei*, Ferr. [*R.A.E.*, A, xviii, 509] has been reported. The leaves of *Derris* have been much damaged by a Galerucid, tentatively identified as *Neolepta biplagiata*, Jacoby, the immature stages of which occur in the soil. A spray of 1·67 lb. pyrethrum powder, 1·67 lb. soap, 0·8 gals. petroleum and 40 gals. water to one acre was found successful against the adults. Two consignments of *Trichogramma nanum*, Zehnt., on which investigations are proceeding in Malaya in connection with the control of moth-borers on rice, have been sent to Ceylon for use against the tea Tortricid [*Homona coffearia*, Nietn.]. *Spodoptera mauritia*, Boisd., which is usually found on rice in nurseries, caused damage in the field, where its occurrence is thought to be due to the unusually dry weather. There is some evidence associating smoke with outbreaks of *Artona catoxantha*, Hmps., on coconuts, and it might be advisable to construct incinerators as far away as possible from the palms.

Noble (N. S.). **Codling Moth Experiments, 1928–29. Summary of the Results at Bathurst Experiment Farm.**—*Agric. Gaz. N.S.W.*, xli, pt. 10, pp. 771–780. Sydney, 1st October 1930.

An account is given of experiments in New South Wales in 1928–29 against the codling moth [*Cydia pomonella*, L.] on apple. Formulae are given for the 14 different treatments employed, which, with the exception of 2 consisting of miscible oils, all contained arsenicals in various dilutions. The value of the treatments was estimated on the basis of the ratio of "stings" to entrances, the percentage of infested fruit and the percentage mortality of the larvae. The poor and irregular setting of the fruit combined with high temperatures and drought conditions resulted in a heavy infestation. Two complete broods and a partial third occurred.

The following is largely taken from the author's summary, the quantities of the insecticide given being those used to 50 gallons of spray: Casein-lime spreader (10 oz.) added to lead arsenate (20 oz.) slightly reduced the infestation, though the percentage mortality of the larvae and the ratio of stings to entrances was lower. Lime-sulphur combined with lead arsenate was more effective than the same strength of lead arsenate alone, though it left considerable residue on the fruit. White oils (1 : 60) combined with lead arsenate definitely reduced the infestation as compared with the same strength of lead arsenate alone. The oil tended to collect dust, and fruit sprayed late in the season might require wiping. Paris green (16 oz. and 3 lb. lime) was more toxic than 20 oz. lead arsenate, though there was little fruit on the trees. Colloidal lead arsenate proved slightly inferior to lead arsenate at the same strength. A calyx and 3 cover sprays of lead arsenate were more effective than 4 cover sprays with no calyx spray. The addition of a fourth cover spray after a calyx spray reduced the infestation. Dusts of lead arsenate combined with lime or sulphur (1 : 10) proved inefficient. Bordeaux mixture showed promise as a repellent, but caused russeting of the fruit.

The results of experiments on baits and bands are also given.

The Mite, *Halotydaeus* (*Penthaleus*) *destructor*, **attacking Wheat.**—*Agric. Gaz. N.S.W.*, xli, pt. 10, p. 766. Sydney, 1st October 1930.

Halotydaeus destructor, Tuck., is recorded for the first time in New South Wales. This mite was observed in 1930 attacking wheat, subterranean clover [*Trifolium subterraneum*] and weeds, but it is probable that wheat would only occasionally be damaged.

Pittman (H. A.). **An Outbreak of "Downy Mildew" (so-called "Blue Mould") of Tobacco in Western Australia.**—*J. Dept. Agric. W. Aust.*, (2) vii, no. 3, pp. 469–476, 2 figs., 8 refs. Perth, W.A., September 1930.

In the course of this article on the "blue mould" of tobacco caused by *Peronospora* sp. in Western Australia, it is stated that every precaution should be taken to control insect pests, since it has recently been found that adults of *Phthorimaea operculella*, Zell., carry the conidia [*R.A.E.*, A, xviii, 589], and such Arthropods as *Smynthurus viridis*, L., or *Halotydaeus* (*Penthaleus*) *destructor*, Tuck., might probably do so. A clear space should be left for several yards round the tobacco beds as a protection against insects that do not fly.

Newman (L. J.). **A new Fruit Fly Lure. Preliminary Report.**—*J. Dept. Agric. W. Aust.*, (2) vii, no. 3, pp. 503–504. Perth, W.A., September 1930.

An account is given of experiments carried out in the winter against *Ceratitis capitata*, Wied. (Mediterranean fruit-fly) with a proprietary bait (Clensel). One glass or tin containing this bait and one containing pollard and borax [*R.A.E.*, A, xvii, 105] were hung in each of ten *Citrus* trees. Between May and August 1,524 flies were caught by the new bait and 604 by the pollard. The glass jars were somewhat superior to the tins.

Newman (L. J.). **Combined Spray for the Destruction of the Clover Springtail (Lucerne Flea)** (*Smynthurus viridis*), **and the Red-legged Earth Mite** (*Penthaleus destructor*).—*J. Dept. Agric. W. Aust.*, (2) vii, no. 3, pp. 506–507. Perth, W.A., September 1930.

Against *Smynthurus viridis*, L., and *Halotydaeus* (*Penthaleus*) *destructor*, Tuck., which usually occur together on clover in Western Australia, a spray of 5 gals. lime-sulphur, 1 gal. Izal, and 250 gals. water was found to be effective. Lime-sulphur alone will control *Smynthurus*. The spray should be applied in May, after the first appearance of the pests, at the rate of 60 gals. to an acre of early pasture, the amount being increased as the season advances. The cost, which is about 5*s*. per acre, makes its application possible over large areas. It is non-poisonous, but animals do not readily feed for 2 or 3 days on pasture sprayed with Izal.

Muggeridge (J.). **The Diamond-back Moth. Its Occurrence and Control in New Zealand.**—*N. Z. J. Agric.*, xli, no. 4, pp. 253–264, 9 figs., 31 refs. Wellington [N.Z.], October 1930.

Plutella maculipennis, Curt., is distributed throughout New Zealand, where it is a serious pest of cabbage and other cruciferous crops, particularly in the South Island. There are six generations a year, and all stages are to be found throughout the different seasons. The spraying or dusting of field crops by any method so far evolved cannot be undertaken owing to expense and mechanical difficulty. In gardens, a spray of 1 lb. Paris green, 3 lb. soap and 50 gals. water may be used, the material being thoroughly applied to both surfaces of the leaves.

The importance and natural enemies of the moth in other countries are discussed. In New Zealand, the only parasite so far found is an Ichneumonid closely allied to *Angitia lateralis*, Grav., but as not more than about 7 per cent. of the larvae are parasitised, it is proposed to introduce other species of the genus from Britain.

Taylor (T. H. C.). **Rhinoceros Beetle—Possibility of accidental Importation from Samoa.**—*Agric. J. Fiji*, iii, no. 3, pp. 129–130. Suva, 1930.

On account of the proximity of Fiji to Samoa, where *Oryctes rhinoceros*, L., is a major pest of coconuts, and of the direct shipping communication between the two islands, the author suggests various measures for the prevention of the introduction of this beetle into Fiji.

Tanabe (C.) & Mishima (R.). **Results of the Studies on *Cinacium iakusuiense*, Kishida (Phylloxeridae).** [*In Japanese.*]—183 pp., 9 pls., 2 charts. Nara, Nara Agric. Expt. Sta., January 1930.

Some of this information on *Cinacium iakusuiense*, Kishida, as a pest of pears in Japan was noticed from another source [*R.A.E.*, A, xvii, 603, where the name of the senior author was incorrectly given as Tabe]. The only forms of the Aphid that move about on the tree are the earlier instars of the parthogenetic individuals, which can live 1–2 days without food. In an experiment, only 25·8 per cent. of the hibernating eggs kept indoors hatched, probably owing to the low humidity. All forms and stages of this Aphid are described.

Toyoshima (A.). **On *Carposina sasakii*, Mats.** [*In Japanese.*]—*J. Plant Prot.*, xvii, pp. 721–728. Tokyo, 1930.

The Tortricid, *Carposina sasakii*, Mats., is the most serious pest of apple in the northern part of Honshiu. An account is given of its life-history, the details of which are similar to those recorded in Korea [*cf. R.A.E.*, A, xvi, 483].

Kuwayama (S.). **Trichopterous Insects with special Reference to the economic Aspect.** [*In Japanese.*]—*Rep. Jap. Ass. Adv. Sci.*, v, pp. 191–202, 3 figs., 14 refs. Sapporo, 1929.

The larvae of the Leptocerid, *Setodes argentata*, Mats., are very injurious to rice in Hokkaido, feeding on the roots of young plants and sometimes occurring in large numbers. *Oecetis nigropunctatus*, Ul., *Limnophilus correptus*, McLach., and *L. amurensis*, Ul., are less serious pests. Scattering sand soaked in petroleum in the field is recommended as an effective control measure.

Kuwayama (S.) & Hori (M.). **Notes on the Cottony Apple Scale, *Phenacoccus pergandei*, Cockerell, in Hokkaido.** [*In Japanese.*]—*Rep. Hokkaido Agric. Expt. Sta.*, no. 24, pp. 1–33, 3 pls., 1 chart, 20 refs. Kotoni, Sapporo, January 1930.

Phenacoccus pergandei, Ckll. (cottony apple scale), all stages of which are described, is widely distributed throughout Japan, but has only recently been found to be a pest of apple in Hokkaido, having been introduced from Honshiu. Of the food-plants recorded, which number over fifteen, only seven are attacked in Hokkaido, including apple, pear, cherry, *Lonicera* and *Hydrangea.* Apple is preferred, but some varieties are only slightly injured. There is one generation a year, the mature larvae hibernating in crevices in the branches or stems. They become active about the middle of March, the males pupating at the end of April. Mating and oviposition take place from the middle of May to the end of June. The eggs hatch in 3 weeks, from 500 to 1,500 being found in one ovisac. Natural enemies include the Coccinellids, *Chilocorus rubidus*, Hope, *C. similis*, Rossi, and *Scymnus* sp.

Wu (C. F.). **A new Design for an entomological Light Trap.**—*Bull. Dept. Biol. Yenching Univ.*, i, no. 4, pp. 51–54, 13 figs. Peping, China, July 1930.

The trap is composed of two sections. The lower one consists of a wooden case, $27\frac{1}{4} \times 24 \times 24$ ins., with short legs and a door on one side, and contains a large tin funnel leading from an opening in the top, $10\frac{1}{2}$ ins. in diameter, into a killing bottle or a glass jar half filled with 80 per cent. alcohol and provided with a cardboard lid, through which the end of the funnel passes.

The top and base of the upper section, which are of wood, are joined together at the corners by four uprights, 11 ins. high. The sides consist of pieces of glass sloping inwards from the top and held at the edges by four wooden supports, the upper ends of which are joined to the uprights, and the lower ones to the base of the section. The closed chamber thus formed, which has a base 6 ins. square, is provided with a small removable lid that carries a socket from which a 100-watt electric bulb is suspended, to attract the insects to the trap. There are four other removable pieces of glass, one at each side of the section, that arise from the base and slope upwards and inwards ; these are held at the edges by four wooden supports, the lower ends of which are attached to the base of the uprights, and the upper ones to the four other sloping supports, which they meet at approximately a right angle. Between the fixed and the removable pieces of glass a slot of about an inch in width is left. The insects enter the trap through it and fall through slots made at the base of the section into the funnel below. Within the lower section, a 50-watt bulb is fixed to one of the sides, opposite the upper half of the jar, to attract the insects crawling in the funnel into it.

Smith (K. M.). **A Textbook of Agricultural Entomology.**—Demy 8vo, xiii+285 pp., 80 figs. Cambridge Univ. Press, 1931. Price 12*s*. 6*d*.

This work attempts to provide a complete and up-to-date account of the insect pests of farm crops and stock in Great Britain. The elements of entomology are omitted, and no attempt has been made to deal with fruit pests, both these subjects having their own text-books, to which reference is made. Insecticides are only considered in cases where it is thought that they would be of use, and instructions for their preparation are given with the details on the insect concerned.

Each chapter has its list of references ; the first is introductory and outlines the organisation of agricultural entomology in England and Wales ; the second treats of the methods of insect control and their application in farming ; and the third discusses the effect of weather conditions on insect outbreaks. Then follow chapters on the insects themselves, and one on insects and virus diseases of crops. Notes on the natural enemies of various pests are included. A list of characteristic symptoms of insect attack on agricultural crops together with the insect responsible, and a list of common farm weeds and the pests associated with them are given as appendices. An index of authors, one of parasites and predators, and a general index complete a work that should prove useful to the agriculturist as well as to the agricultural entomologist.

Metcalf (Z. P.). **A Text-book of Economic Zoology.**—Med. 8vo, x+17–392 pp., 236 figs. London, H. Kimpton, 1931. Price 18*s.*

This English edition of a text-book printed in America is designed to furnish material for teaching the fundamental principles of zoology from the applied standpoint, and stress has been placed throughout it on economic importance and bionomics rather than on morphology. Numerous illustrations (mostly original line drawings) have been introduced because it is believed that if these are carefully made and studied they will give the student a maximum of information in a minimum of space. The omission of lengthy anatomical details and of bibliographical references has enabled the author to assemble a mass of detail within a small compass.

One chapter (pp. 172–189) is devoted to the Arthropoda in general, and others to the Arachnida and Myriapoda (pp. 190–207) and to insects (pp. 208–274).

Kuwayama (S.). **Studies on the Corn Borer,** *Pyrausta nubilalis* **Hübner, in Japan.** [*In Japanese.*]—*Rep. Hokkaido Agric. Expt. Sta.*, no. 25, pp. 1–140, 5 pls., 155 refs., text ill. (With a Summary in English, pp. (1)–(13).) Kotoni, Sapporo, March 1930.

Some of this information on *Pyrausta nubilalis*, Hb., in Japan, has already been noticed [*R.A.E.*, A, xviii, 301]. In Hokkaido the eggs are parasitised by a small Chalcid, and the larvae by the Tachinids, *Exorista* sp. and *E. tritaeniata*, Rond., the Ichneumonids, *Pimpla pyraustae*, Mats., *Eugnomus pyraustae*, Mats., *Eulimneria* (*Limnerium*) sp., *Angitia pyraustae*, Uchida, and *Cryptus* sp., and a Braconid, *Microgaster* sp. The larvae are frequently preyed upon by those of the Carabid, *Chlaenius* sp., and during the winter and spring woodpeckers remove a considerable percentage of the borers from the stems of bamboo-grass (*Sasa paniculata*) piled up in fields after being used as poles for beans.

Kuwayama (S.). **Notes on the Japanese Pyraustinae injurious to Agricultural and Horticultural Plants.** [*In Japanese.*]—*Rep. Hokkaido Agric. Expt. Sta.*, no. 25, pp. 141–181, text ill. (With a Summary in English, pp. (15)–(19).) Kotoni, Sapporo, March 1930.

The English summary contains a list of 27 species of Pyralids of the subfamily of Pyraustinae with their food-plants, followed by tabulated notes on their bionomics and the injury they cause.

Roubaud (E.). **Biological Researches on** *Pyrausta nubilalis*—**III.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 1–27, 13 figs., 2 refs. Chicago, Ill., 1930.

Studies of the biology of *Pyrausta nubilalis*, Hb., carried on since 1927 [*R.A.E.*, A, xvii, 210; xviii, 141] were directed in 1929 to the

determination of the degrees of natural and acquired resistance to borer attack exhibited by different varieties of maize, and the possibility of strengthening the spontaneous resistance of certain varieties. The technique used in these experiments, which was adapted from that of Vouk and Hergula [xviii, 149], is described. The moths were induced to oviposit on muslin cages from which sections were cut when the eggs were about to hatch and fastened to the stem or leaves of the plant to be infested. American varieties contracted a much more severe infestation than European ones, and experiments in multiple infestation indicated that the resistance of American plants to successive infestations is in general less developed than that of the European ones,an initial attack on highly susceptible American varieties failing to protect infested plants against severe attacks of fresh larvae. It has often been observed with plants of both American and European origin that whereas some of a batch of larvae placed on them mature in the ordinary way, the development of others is retarded and they remain on the outside of the plant. It is suggested that the plant's reaction to the lesions produced by the most active larvae restrains the development of the others. This is borne out by the fact that a plant infested with 200 eggs on 14th August was found when examined on 14th September to harbour one large borer in the stem while 5 small larvae were feeding on it externally.

If reaction to infestation is due to physiological changes resulting from lesions produced by the larvae, it may be concluded that artificial lesions will produce an analogous result. To verify this theory, plants of different varieties of maize were subjected to cuts in the leaves or stems and other mutilations before being infested or superinfested with *P. nubilalis*. It was definitely found that a smaller proportion of the larvae developed on the injured plants, and a smaller proportion of the larvae recovered had caused severe damage by boring. On mutilated and superinfested plants, even of the very susceptible American varieties, the second infestation was checked to such an extent that not more than one or two larvae survived. The relative size of larvae of comparable age is generally indicative of the more or less favourable conditions to which they are subjected on the plant. The growth of the larvae is favoured in dead or weak parts of the food-plant, and damage caused by boring is most pronounced in weak plants. The resistance of the normal vigorous plant may be strengthened by certain light mutilations, which will be more effective when applied to growing than to mature plants. If the lesions are too severe, however, an adverse result is produced.

Experiments carried out to determine the extent to which acquired resistance is hereditary showed that under comparable conditions of infestation ordinary plants develop 3 times as many larvae as those from infested parents.

Tests with two strains of *P. nubilalis* from Canada and one from Rumania and strains of mugwort (*Artemisia vulgaris*) from Paris and Hungary confirm the attraction found to be exercised on the ovipositing moths by this plant [xviii, 141], which is capable of directing the attack of borers from all regions to itself and entirely absorbing it. In order to allow mugwort to play its part in attracting the majority of the borers to itself, it would be necessary to plant it on a sufficiently large scale on the borders of maize fields. The dead stems, which contain most of the hibernating borers, should be carefully gathered and burnt in winter.

Experiments with natural cryolite, which adheres well to the foliage and can be easily distributed with dusting machines, indicated that it is likely to prove effective in preventing the establishment of the larvae.

METALNIKOV (S.), ERMOLAEV (J.) & SKOBALTZYN (V.). **New Bacteria pathogenic to the Larvae of** *Pyrausta nubilalis* **Hb.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 28–36. Chicago, Ill., 1930.

A preliminary analysis is presented of six new species of virulent bacteria infecting *Pyrausta nubilalis*, Hb., *per os*, five of which were isolated from larvae sent from the Pyrenees and the sixth from Italy. Pending complete analysis, the following provisional names have been allotted : *Bacterium pyrenei* nos. 1, 2 and 3 ; *B. cazaubon* nos. 1 and 2 ; and *B. italicum* no. 2. *B. pyrenei* no. 1 and *B. cazaubon* nos. 1 and 2, which were among the most virulent bacteria tested in 1929, kill the larvae in 10–15 hours, whereas the remaining species kill in 20–24 hours. A very virulent species has also been discovered among several bacteria isolated from larvae of *P. nubilalis* from Russia. Recently isolated bacteria have been found to be more virulent than those cultivated for some time on artificial media. Experiments carried out to develop methods for the preservation of virulence show that the best results are obtained with a mixture of potato broth and peptone. Other experiments using different vegetable media prepared on yeast and bran gave very favourable results. A method for the preparation of spores is described. The spores were either dusted in powder form (with talc, etc.) on the plants or used as emulsions, which were prepared by adding fixed quantities of water to the dry spores. The results of a number of experiments showed that the spores do not lose their virulence for some months after preparation.

ELLINGER (T.). **Preliminary Note on Corn Borer Parasites collected in 1929–1930 in the Union of Socialistic Soviet Republics.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 39–41. Chicago, Ill., 1930.

Parasites of *Pyrausta nubilalis*, Hb., bred in the Russian Union in 1929 included, in addition to the species recorded for the previous year [*R.A.E.*, A, xviii, 145], *Angitia* (*Inareolata*) *punctoria*, Rom., and the Tachinids, *Zenillia* (*Clemelis*) *pullata*, Mg., and *Tachina civilis*, Rond. Specimens agreeing more or less with certain allied species of doubtful status have been included under the heading *Eulimneria* (*Limnerium*) *alkae*, Ell. & Sacht. The collection in 1929 of the female of the parasite identified in 1928 as *Cremastus* (?) *hierochonticus*, Schmied., makes it doubtful whether this identification is correct. *Mesochorus confusus*, Hlgr., which has been considered as possibly a parasite of *P. nubilalis*, has now been bred, according to Dr. N. F. Meyer, from *E. alkae*. Parasites bred in Paris from a shipment of living larvae of *P. nubilalis* from the Ukraine and the Caucasus, which emerged early in 1930, were *E. alkae*, *Ceromasia* (*Lydella*) *senilis*, Mg., and *Zenillia roseanae*, Br. & Berg. A complete list of the parasites of *P. nubilalis* collected in the Russian Union now includes 13 species, all but 3 of which have been found for the first time during the present investigations.

SACHTLEBEN (H.). **Notes on *Pyrausta nubilalis* Hb. and its Parasites in Bulgaria and Roumania.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 42–57, 9 figs., 26 refs. Chicago, Ill., 1930.

A brief history is given of *Pyrausta nubilalis*, Hb., in Rumania and Bulgaria, where a tour was made in September and October 1929 with the object of recording observations in the only important maize-growing region where little attention has yet been paid to it. It was first recorded as a pest in Bulgaria in 1906, and was mentioned as causing injury in several localities in 1925. It is unlikely that more than one generation occurs in northern Bulgaria, where the pupal stage lasts 10–12 days, and where pupae were found from 13th to 26th July and moths from 24th July till 7th August, but in the south, where moths have been observed from the beginning of May till the middle of August, a second generation may occur. *P. nubilalis* has been recorded in Bulgaria on hemp, hops and beans, as well as maize. A study on 7th September 1929 in maize growing near Sofia showed only 0·5 per cent. infestation, the largest number of larvae in a stalk being 5, but an infestation of 25–30 per cent. was discovered in a locality in the Balkan mountains examined three days later. Infested plants usually contained 1–3 larvae, with a maximum of 10 to a stalk. The ears were frequently attacked, and most of the actual injury was found in them, larvae being found only twice in the underground part of the stalks. Infested grain was often secondarily infected with fungi. The following parasites were collected: *Eulimneria* (*Limnerium*) *alkae*, Ell. & Sacht., *Microbracon brevicornis*, Wesm., *Eulophus viridulus*, Thoms., and *Ceromasia* (*Lydella*) *senilis*, Mg. In another area examined in September 1929, where *P. nubilalis* had been abundant in 1927 and 1928, no damage and few borers were found, probably owing to a severe drought that had prevailed since May.

An examination of the area under maize in Bessarabia, which has a typical steppe climate and the lowest precipitation in Rumania, showed an infestation of less than 1 per cent. on 21st September 1929, *M. brevicornis* being the only parasite found. The influence of drought on *P. nubilalis* is demonstrated by the fact that an infestation of over 50 per cent. was found, on an island in the Danube, only about 12 miles away, where the humid conditions produced rich vegetation. Maize examined at two points in river valleys near the Carpathian Mountains showed an average infestation of 10 per cent., 75 per cent. of the larvae being located in the part of the stalks nearest the ears. Fields situated in shade close to forest were most severely attacked. The parasites collected were *Eulimneria alkae*, *M. brevicornis*, *Eulophus viridulus*, *C. senilis* and *Zenillia* (*Exorista*) *mitis*, Mg.

An infestation of 1–5 per cent. was found in the last locality investigated, which was still within the forest region but in the oak zone and approaching the steppe. Harvested maize was examined on 8th October, and the infested plants contained an average of 1–3 larvae with a maximum of 8. Many were located in the upper parts of the stalks and tassels, and no evidence of a downward movement was noticeable. Larvae of *P. nubilalis* were also collected from *Amaranthus retroflexus*, but none could be found in *Artemisia absinthum*. An additional parasite observed was *Pimpla* (*Exeristes*) *roborator*, F. Notes are given on the seven species of parasites found during this investigation, which in addition to those already mentioned include *Angitia* (*Inareolata*) *punctoria*, Rom., bred from larvae from a locality situated to the west of the Carpathian Mountains.

Kunike (G.). **The Corn Borer Situation in Baden (Germany) in the Year 1928.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 58–63, 1 ref. Chicago, Ill., 1930.

Observations on the infestation by *Pyrausta nubilalis*, Hb., in Baden in September and October 1928 are recorded in continuation of the investigations of Zwölfer [*R.A.E.*, A, xvi, 56; xvii, 216; xviii, 458]. In the chief maize-growing region the average degree of infestation increased from 65·3 per cent. in 1926 and 68·3 per cent. in 1927 to 84·7 per cent. in 1928, and in one area, in spite of an attempt to combat the borer by composting the maize stalks and covering them with a layer of potato stems, which were burned in the spring of 1928, the percentage of infestation rose from 28·5 to 88 per cent. Where both late and early planted maize are present, the latter is more subject to attack; late-planted maize for silage was practically free from infestation even when growing close to severely attacked fields. Experiments in planting potatoes among maize showed that a specially heavy attack is produced in pure maize adjacent to mixed fields, but where only mixed fields are available the moths oviposit in them as usual. A study of the site of occurrence of the larvae at different dates showed that at harvest time most of them have sought refuge in the stubble or in the cobs. The percentage of tunnels of a secondary character, bored after the larvae had left their original abode in the plant, was 7, 33 and 42 on 17th September, and 4th and 18th October respectvely. A method of estimating commercial injury on the basis of classifying three types of damage caused to the ears is described. The average degree of parasitism during October 1928 in three localities was 11·9 per cent., the majority of the parasites being *Microgaster tibialis*, Nees, and the remainder *Eulimneria* (*Limnerium*) *alkae*, Ell. & Sacht. The puparium of a Tachinid was collected from a maize stalk on 9th September 1928, and on the same day a dead larva of *P. nubilalis* was found together with pupae of *Microbracon brevicornis*, Wesm., which were subsequently bred out in the laboratory. The next generation of this Braconid, which was reared on *P. nubilalis* and *E. kühniella*, Zell., consisted entirely of males.

Wallengren (H.). **On the Infection of** *Pyrausta nubilalis* **Hb. by** *Metarrhizium anisopliae* **(Metsch.) Sor.—II.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 64–73, 2 figs., 5 refs. Chicago, Ill., 1930.

On the basis of the results secured in the previous investigations [*R.A.E.*, A, xviii, 151], the effect of *Metarrhizium anisopliae* was studied during 1929 on the eggs and young larvae of *Pyrausta nubilalis*, Hb. Preliminary studies showed that the fungus had no effect on maize plants or mammals. An account is given of the activities of hibernating larvae kept in glass tubes in the laboratory. The normal mortality of newly hatched larvae varied considerably, the average for all experiments being 75 per cent. In experiments in which egg clusters were dusted with the conidia, the fungus failed in every case to attack the eggs, but maize plants dusted with conidia alone or mixed with potato flour were completely protected from attack by the larvae, only 8 living individuals being recovered from 1,213 deposited on the plants, representing a mortality of 99·3 per cent. About the same mortality was obtained in comparative experiments by dusting the plants with Paris green, lead arsenate, calcium arsenate, copper carbonate and sodium fluosilicate.

MARCHLEWSKI (L.). **On the Use of Chemicals in the Fight against** *Pyrausta nubilalis.* **A Preliminary Report.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 74–80, 1 fig. Chicago, Ill., 1930.

A brief account is given of inconclusive experiments to ascertain whether the preferred food-plants of *Pyrausta nubilalis*, Hb., contain aromatic substances that could be used to attract the moths. Extracts were made either by the action of alcohol and removal of alcohol by distillation at low pressure, whereby a residue is left for direct application, or by placing pieces of the plants in a thermostat at 50° C. [122° F.] next to glass containers with pure vaseline. By the latter method an attempt was made to fix the vaporous substances of the plant, among which were ethers, terpenes and ketones. The moths, which were of Canadian origin, distributed themselves, more or less evenly on the glass containers of the various substances though one that contained dissolved sugar with 1 per cent. amyl acetate attracted about 30 per cent. more than the others.

Experiments with hydrocyanic acid gas and ammonia showed that it is impossible to destroy the larvae, after they have bored into the stalks, by means of gases, since these do not penetrate into the interior of the plants. Chemical methods of control are only successful when applied at the moment when the newly hatched larvae are on the surface of the plants. Laboratory experiments showed that arsenic applied in the form of smoke from torches of arsenious anhydride with a suitable burning medium is effective against the larvae. Reports on field experiments with arsenic torches carried out by T. Ellinger in Hungary and by V. Vouk in Rumania indicate that this method is practical for general use. It was found necessary to place the torches at least 16 ft. from the first row of plants, as those situated closer suffered from the smoke and eventually withered. No larvae were recovered on re-examination from 5 plants on each of which 25 newly hatched larvae had been placed one hour after treatment by the smoke cloud ; 12·7 per cent. were recovered from plants similarly infested 10 days after treatment ; and 19·2 per cent. were recovered from control plants.

KOTLAN (A.) & VARGA (E.). **The Aspects of chemical Warfare against the Corn Borer.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 81–90, 3 figs., 2 refs. Chicago, Ill., 1930.

An account is given of the work carried out at the Budapest laboratory in relation to the control of *Pyrausta nubilalis*, Hb., by chemical methods. Tests with 12 inorganic and 22 organic compounds showed that the use of any chemical in gas form is ineffective against larvae in the interior of maize stalks, and even if it were efficient against other developmental stages of the borer, its use under field conditions would be impracticable owing to the limited duration of the effect of the gas. The best result under laboratory conditions was secured with ammonia gas in a concentration of 0·00181 at 17° C. [62·6° F.] and atmospheric pressure, which killed 100 per cent. of the fully exposed larvae and 50 per cent. of those in the stalks in 15 minutes. The moths all died in 3 minutes. Experiments were then conducted with a number of organic substances in liquid form in an endeavour to find some that might exert a prolonged effect as insecticides or in producing attracting or deterrent odours. Of a number of chemicals

acting as vapours, used in the laboratory at a temperature of 18–21° C. [64·4–69·6° F.], the best effect was obtained with nitrobenzene vapours, which in a 0·133 per cent. concentration killed 100 per cent. of the larvae in 72 hours and 100 per cent. of the moths in 2 hours. Egg-clusters treated with nitrobenzene, paradichlorobenzene, dinitrobenzene, bromobenzene or benzaldehyde as contact insecticides almost invariably failed to hatch. Field experiments with some of these chemicals as sprays on naturally or artificially infested maize plants indicate that paradichlorobenzene might be used to kill the eggs. Attempts are now being made to construct candles so that this compound may be distributed by fumigation.

Husz (B.). **Field Experiments on the Application of** *Bacillus thuringiensis* **against the Corn Borer.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 91–93, 1 fig., 2 refs. Chicago, Ill., 1930.

Experiments in the use of *Bacillus thuringiensis* for the control of *Pyrausta nubilalis*, Hb., that were begun in 1928 [*R.A.E.*, A, xviii, 148], were continued under similar conditions in Hungary in 1929, except that higher concentrations of bacterial emulsion were used and two applications given, on 12th and 19th July. For one plot the spore content of 16 petri dishes, and for three others half that amount, was diluted with 9 pints of well water, about 200 cc. of the emulsion being applied to each plant. For a fifth plot, a bacterial powder was prepared by mixing the spore content of 20 petri dishes with 300 gm. talc. When the plots were examined in the first week in September, the data showed consistent differences in favour of the treated plots, although it was clear that the applications should have been made a week earlier, before the larvae had entered the plants. The infestation, which was lighter than in the previous year, was nevertheless reduced from 44 to 25 per cent. through bacterial treatment, and the percentage of infested stalks from 26 to 14. Whereas the number of bore-holes in 100 untreated plants was 150, only 41 were found in 100 treated plants, and the number of bore-holes to an individual plant also showed considerable reduction. The results secured would no doubt have been more striking had the infestation been heavier. There is apparently no special advantage in the application of a very concentrated emulsion. The dusting method, which renders feasible a large scale treatment of maize fields by aeroplane, gave results equal to those secured by spraying.

Chorine (V.). **On the Use of Bacteria in the Fight against the Corn Borer.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 94–98. Chicago, Ill., 1930.

An account is given of further experiments with bacteria pathogenic to *Pyrausta nubilalis*, Hb. [*R.A.E.*, A, xviii, 144], in which corn borer material from Hungary, Russia, Jugoslavia and Canada was used in conjunction with the following bacteria: *Bacterium thuringiensis*, *B. cazaubon*, *B. pyrenei* nos. 1 and 2, and *B. galleriae* no. 2. The experimental technique is described. The nutrient broth used in previous experiments was abandoned as it is liable to become toxic when it dries up, causing the bacteria to lose their ability to kill *P. nubilalis* by the mouth. *B. thuringiensis* was used in powder form,

prepared by diluting 12-day-old cultures grown in Roux-bottles in a small quantity of water with the addition of some talc. The emulsion, after being placed on a large tray in an incubator at 37° C. [98·6° F.] for 24–48 hours till dry, was pulverised with a mortar. More talc may be added to increase the dilution of the powder, but in any case the amount of spores to a plant is much greater with dusting than with spraying.

A study of the various methods of applying the bacteria showed that to be effective they must be applied within a period of 10–14 days, corresponding with the oviposition period of *P. nubilalis*, and that they should continue to be capable of attacking the young larvae, which often remain on the surface of the leaves for 10 days after hatching. The concentration of the emulsions was 1 petri dish to 5 pints of water, sufficient to spray up to 1,200 plants. All experiments were carried out from 21st June to 15th July, and each plant was infested with 25 larvae. The experimental plots were harvested between 9th and 18th September, every plant being dissected and the number of larvae recorded. The best results (over 98 per cent. mortality) were obtained with *B. thuringiensis*, *B. cazaubon* and *B. pyrenei* no. 1. The effect of *B. galleriae* no. 2 (90·8 per cent. mortality) was again poor. Results secured with *B. thuringiensis*, which confirm those of the previous year, show that it should be applied shortly after oviposition is at its maximum, since the treatment begins to lose its effectiveness a week after spraying, though it continues to be effective for two weeks after the larvae have hatched. It is concluded that although these bacteria cannot be used in prophylactic treatment, since they lose their effectiveness too soon, they may be successfully used to destroy the young larvae that have hatched.

Ellinger (T.) & Chorine (V.). **Report on a Corn Variety Test under Corn Borer Conditions.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, p. 99–100, 1 ref. Chicago, Ill., 1930.

Maize from Natal, said to be of the same origin as that used by Hase (dent de cheval) [*R.A.E.*, A, xviii, 146], was subjected to comparison with a strain of American maize, adjacent rows of each variety being infested with equal numbers of newly hatched larvae of *Pyrausta nubilalis*, Hb. When the experimental plots were harvested, only 52 larvae had developed on the variety from Natal for every 100 on the American variety.

Sachtleben (H.). **On the Parasites of *Pyrausta nubilalis* Hb. in Hungary.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 101–112, 5 figs., 18 refs. Chicago, Ill., 1930.

Observations during this study in Hungary show that the first larvae of *Pyrausta nubilalis*, Hb., did not appear until the beginning of July in 1930, the degree of infestation of maize varying mainly between 0·5 and 5 per cent., and rising in rare cases to 10 per cent. Of 872 larvae collected in western Hungary, 19·4 per cent. were parasitised, the species concerned being *Eulimneria* (*Limnerium*) *alkae*, Ell. & Sacht., *Microbracon brevicornis*, Wesm., *Eulophus viridulus*, Thoms., and *Ceromasia* (*Lydella*) *senilis*, Mg. In addition *Angitia* (*Inareolata*) *punctoria*, Rom., and *Phaeogenes nigridens*, Wesm., which has never before been recorded from Hungary as a parasite of *P. nubilalis*,

were bred from larvae collected in eastern Hungary. In the laboratory, moths developed during the summer from 2·4 per cent. of the larvae; pupation took place between 19th July and 8th August, and the adults emerged between 30th July and 25th August. It appears that second generation moths were unusually numerous in Hungary in 1930. A considerable number of *E. alkae* and *C. senilis* also completed development during the summer and produced a second generation.

Notes are given on all the parasites bred, the characters distinguishing *P. nigridens* from *P. planifrons*, Wesm., under which name it was first recorded as a parasite of *P. nubilalis* [*R.A.E.*, A, xvi, 528; xvii, 726], are given from a study of the types, and the revised description of *P. nigridens* by Wesmael is quoted. *E. alkae* was the most important parasite of *P. nubilalis* in western Hungary, 8·8 per cent. of all larvae and 45 per cent. of all those parasitised being attacked by it. *C. senilis* was found to be second in importance, attacking 6·6 per cent. of all larvae and 34 per cent. of those parasitised; *M. brevicornis* attacked 2·3 per cent., or 15·9 per cent. of those parasitised.

VOUK (V.). **The Fight against the Corn Borer in Yugoslavia.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 113–115, 1 pl. Chicago, Ill., 1930.

An outline is given of the points developed in regulations issued by the Minister of Agriculture in Jugoslavia in respect of the control of the corn borer [*Pyrausta nubilalis*, Hb.]. These include a brief popular version of the life-history and a description of the injury caused. Maize stalks must be cut to the ground at harvest or the stubble burnt before 15th May. The stalks should be used for fodder, etc., any remnants being burnt. The use of maize stalks for permanent roofs or fences is prohibited, and any used for temporary roofing must be burnt before 15th May. Maize stalks required for fuel after that date must be stored in a ditch of sufficient depth and covered with straw and earth. This ditch may be opened only enough to remove material for 2–3 days' use and must be closed again after each opening. All these regulations apply equally to *Sorghum*. An illustrated popular pamphlet containing a description of *P. nubilalis*, the damage caused by it and control measures, and a large instructive poster, which is reproduced and described, have been widely distributed.

VOUK (V.). **A Corn Variety Test under artificial Corn Borer Infestation.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 116–120, 2 figs. Chicago, Ill., 1930.

In view of experiments indicating that certain varieties of maize show practically no signs of attack after artificial infestation with *Pyrausta nubilalis*, Hb. [*R.A.E.*, A, xviii, 142, 146] and the fact that in Jugoslavia some of these varieties are nevertheless attacked, 9 varieties were tested in Zagreb in 1929, when it was found that practically no difference existed among them with respect to the number of larvae surviving. The damage sustained by plants infested by an equal number of larvae varied, however, considerably, the more robust varieties such as the dent de cheval and flint maize group maturing fully and showing little injury, whereas in other varieties the plants were broken and withered, with poorly developed ears.

It is suggested that this may be described as a constitutional resistance of certain varieties liable to larval infestation. In experiments in 1930, 12 varieties of maize all reacted similarly, as regards number of larvae recovered, to simultaneous artificial infestation with 25 young larvae to each plant. It is suggested that an investigation of the reactions of *P. nubilalis* in regard to oviposition on the different varieties might yield more valuable results.

HERGULA (B.). **The Corn Borer Situation in southern Yugoslavia.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 121–129, 3 figs., 12 refs. Chicago, Ill., 1930.

An account is given of two expeditions made in southern Jugoslavia to secure data in regard to *Pyrausta nubilalis*, Hb., and its parasites. The first, which covered southern Dalmatia and Montenegro, was made in October 1929, and the second, through Macedonia, in March 1930. The statistics of the Ministry of Agriculture for these districts in 1928 are given. Maize is grown rather sparsely, in tiny fields in southern Dalmatia, and only on the river alluvium in the eastern districts. In southern Dalmatia and Montenegro the climate is Mediterranean ; in the eastern districts mainly continental. Methods of cultivation are primitive, rotation being in many places unknown. The maize stalks are cut off just below the ears, the ears only being picked in many cases and the stalks left in the field, where they are ploughed down in the spring or even left standing until the end of the following summer. The heaviest infestation was found in southern Dalmatia, where the percentage averaged 76·7 and rose in some cases to over 90. In Montenegro, the infestation was considerably lower, 10–30 per cent., and in Macedonia the highest average of infestation of a locality was 64 per cent., though in two neighbouring localities infestation was negligible. Experiments in the relative susceptibility of the maize varieties grown failed to disclose any difference, and the methods of cultivation favour the propagation of *P. nubilalis*.

As in northern Jugoslavia [*R.A.E.*, A, xvii, 219 ; xviii, 149], no indication was found of the occurrence of a second generation, but corn borer material brought from southern Dalmatia in the autumn of 1929, living under normal conditions in maize-fields at Zagreb, where native corn borers were as usual single-brooded, developed a second generation in 1930, the moths flying again from late July to the middle of September. This indicates that *P. nubilalis* is double-brooded in southern Dalmatia, and that this quality is hereditary, but as only one generation appears to develop on maize, which is not planted there until late June or early July, it is probable that the first generation occurs on some other food-plant. The presence of young larvae in the late autumn would indicate that they belong to a second generation, and *Zenillia roseanae*, Br. & Berg., a Tachinid known only in two-brooded areas, is the principal parasite in this region.

Maize is also attacked in southern Jugoslavia by *Sesamia cretica*, Led., which is widely distributed along the coast and is occasionally found further inland, causing serious injury in several localities. The larvae are much more destructive than those of *P. nubilalis*, on account of their larger size, and because the ears and the grain are direct objects of attack. In 5 localities where the two borers were found together

the percentage of *S. cretica* in relation to *P. nubilalis* varied from 0·1 to 75. *S. cretica* appears to prefer broom corn (*Sorghum*), and in many localities was found only on this plant. In some fields *P. nubilalis* infested 20 per cent. of the maize but was rare on the *Sorghum* plants, 40 per cent. of which were attacked by *S. cretica*, which had left the maize alone. No parasites were obtained from *Sesamia*, which has two generations a year on maize. Parasites bred from *P. nubilalis* in southern Jugoslavia were *Mermis* sp., the Ichneumonid, *Pimpla* (*Exeristes*) *roborator*, F., which is recorded for the first time from this country, the Braconid, *Chelonus annulipes*, Wesm., and the Tachinids, *Ceromasia senilis*, Mg., and *Zenillia roseanae*, Br. & Berg.

HERGULA (B.). **On the Application of** *Metarrhizium anisopliae* **against** *Pyrausta nubilalis.*—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 130–141, 1 ref. Chicago, Ill., 1930.

Though in laboratory experiments *Metarrhizium anisopliae* did not attack the eggs of *Pyrausta nubilalis*, Hb. [*cf. R.A.E.*, A, xix, 148], the young larvae hatching from dusted egg-clusters were quickly killed by the fungus. In further experiments with young larvae, in which an attempt was made to imitate field conditions, a mortality of 100 per cent. was obtained on maize plants the leaves of which had been dusted with the conidia, as compared with 34·8 per cent. on untreated plants. Although similar experiments with the pupae have not yet been completed, it is known that the fungus is able to attack and kill this stage also.

In field experiments carried out in Jugoslavia in 1930, the dusting of maize plants with *Metarrhizium* conidia increased the mortality of the larvae of *P. nubilalis* from 85·6 per cent. on undusted to 99 per cent. on dusted plants, and decreased the percentage of infestation from 98 to 25·1. The spores were equally effective whether mixed with starch, dextrin or tragacanth, and it was immaterial whether or not the plants had been sprayed with water before dusting, but the weather was rainy.

HERGULA (B.). **On the Mortality of** *Pyrausta nubilalis* **Hb.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 142–147, 4 refs. Chicago, Ill., 1930.

This report covers a little more ground than one recently noticed from a Serbian source [*R.A.E.*, A, xix, 129].

A study of the fate of the eggs of *Pyrausta nubilalis*, Hb., was undertaken in Jugoslavia in 1928 and 1929 in view of the great disparity observed between the number of eggs deposited by each female moth and the number of larvae present in the maize fields. Exact observations on 1,324 eggs deposited in 50 clusters on maize plants in June and July 1929 showed a highly variable mortality, which averaged 34·1 per cent. All eggs hatched in 8 clusters and none in another 8. Experiments were then carried out to determine the mortality of the young larvae. An artificial infestation was made between 14th and 22nd July in small plots of 4 rows, plants in the first row each receiving 15 larvae, those in the second 30, and those in the last two being left uninfested. Most of the non-infested plants were heavily attacked in September when they were harvested, many of the larvae having migrated to them or been carried to them by the wind. The fact

that lesions were found on originally non-infested as well as infested plants in the beginning of August shows that it is the young larvae that migrate. Migration by mature larvae was observed only to a negligible extent. Only 28 per cent. of the larvae survived until harvest, the variety of maize, among 9 tested, being apparently of no consequence. During a second examination of the experimental plants in September, 6·4 per cent. of the developed larvae were dead, 74 per cent. of these having been killed by bacteria and fungi, and 26 per cent. by insect parasites. Of the larvae left to hibernate in maize stalks in the field, 8·2 per cent. died during the winter, but only 2·7 per cent. of the pupae failed to develop. The total mortality from egg to adult amounted to 84·5 per cent. As regards the factors influencing mortality, it was found that larvae usually hatch from all except non-fertilised eggs ; 4·5 per cent. of 4,700 eggs examined in the field were not fertilised. The eggs are injured by being exposed to the direct rays of the sun, and strong wind at the time of oviposition materially increases their mortality. A very large number of hatching larvae die early under the most favourable circumstances, or succumb a little later to slightly unfavourable weather conditions ; and many fall to the ground in the course of migration and die for lack of food. Under moist conditions many of the egg-clusters are destroyed by fungi. Twelve species of parasites of *P. nubilalis* have been found in Jugoslavia, of which the most important are *Eulimneria* (*Limnerium*) *alkae*, Ell. & Sacht., *Angitia* (*Inareolata*) *punctoria*, Rom., *Microbracon brevicornis*, Wesm., *Ceromasia* (*Lydella*) *senilis*, Mg., and, in the south, *Zenillia roseanae*, Br. & Berg. The maximum degree of parasitism is about 30 per cent., but it varies greatly in different regions as well as from year to year.

METALNIKOV (S.), HERGULA (B.) & STRAIL (D. M.). **Experiments on the Application of Bacteria against the Corn Borer.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 148–151. Chicago, Ill., 1930. **Utilisation des microbes dans la lutte contre la pyrale du maïs.**—*C.R. Acad. Sci. Fr.*, cxci, no. 17, pp. 738–740, 2 refs. Paris, 1930.

An account is given of experiments carried out in Jugoslavia in which *Bacterium cazaubon*, *B. thuringiensis* and *B. pyrenei* nos. 1 and 2 were used as emulsions, and the same bacteria with the addition of *B. galleriae* no. 2 and *B. italicum* as dusts, against *Pyrausta nubilalis*, Hb., on two varieties of maize. In some cases the different bacteria were combined in various mixtures. A bacterial emulsion was made after 4–10 days from cultures grown mainly on potato agar, the bacteria being diluted in 100 cc. sterile water. Before the application, the original emulsions were mixed with water in the proportion of 1 : 10 or 1 : 20. The bacterial powders were prepared 3–5 months before application. Thirty newly hatched larvae of *P. nubilalis* were placed on each maize plant 1–3 days after the applications had been made, untreated plants receiving at the same time 15–30 larvae. When weather conditions were stormy, the infestation with larvae sometimes took place only 5–10 hours after spraying. The experiments were made in June and the final examinations carried out in August, when each plant was carefully dissected and the number of larvae present recorded. The mortality of the larvae, as taken from the summarised results of all experiments, varied from 96·8 to 99·2

per cent. as compared with 81·7 to 87·5 in the untreated plots. An average mortality of 98 per cent. was secured by dusting with bacterial powders.

The second paper gives a rather fuller account of some of the experiments, the results of which are summarised in the first.

METALNIKOV (S.). **Utilisation des microbes dans la lutte contre** *Lymantria* **et autres insectes nuisibles.**—*C.R. Soc. Biol.*, cv, no. 32, pp. 535–537, 1 ref. Paris, 28th November 1930.

Experiments carried out in 1929 demonstrated that the larvae of *Porthetria* (*Lymantria*) *dispar*, L., readily become infected by bacteria isolated from *Pyrausta nubilalis*, Hb. These experiments were continued in Jugoslavia with a large number of larvae of *Porthetria* collected in the field. A considerable proportion of these larvae were found to be affected with disease, and bacteria have been isolated and are in the course of being studied. Experiments made with one particular strain of these bacteria showed it to have a high degree of virulence for the larvae. Experiments are described in which the three most virulent bacteria isolated from *Pyrausta*, *Bacterium cazaubon*, *B. pyrenei*, and *B. thuringiensis* [*cf. R.A.E.*, A, xix, 151], were used in emulsion and powder form for treating leaves on which larvae of *Porthetria* and *Pieris brassicae*, L., were fed. *B. cazaubon* and *B. pyrenei* in emulsion and *B. thuringiensis* in powder form gave 100 per cent. mortality in four days against *Porthetria*, and 100 per cent. mortality was secured in two days with *B. pyrenei* and *B. thuringiensis* in powder form against *Pieris*. Other Lepidoptera against which these cultures were similarly tested and found effective were *Aporia crataegi*, L., *Stilpnotia salicis*, L., *Ephestia kühniella*, Zell., and *Vanessa urticae*, L.

FEYTAUD (J.). **Sur une invasion d'éphippigères.**—*Rev. Zool. agric.*, xxix, no. 5, pp. 69–79, 3 figs., 6 refs. Bordeaux, May 1930.

An account is given of an outbreak in a vineyard near Bordeaux of *Ephippiger ephippiger*, Fieb., which was abundant on vine foliage and on adjacent grasses and bushes, and *Uromenus* (*E.*) *rugosicollis*, Serv., which, though rare on vines, was numerous on neighbouring bramble patches. The infested vines, were near uncultivated land covered with bushes and grass, part of which had recently been cleared. A popular description of the appearance and habits of Tettigoniids of the genus *Ephippiger* is given [*R.A.E.*, A, xvi, 344]. They are active from spring till autumn and pass several months in the larval stages, becoming adult about midsummer. They feed greedily, devouring the foliage of various trees, bushes and plants, the colour of which they adopt. The attack on the vine may be primary, when they develop entirely on it, or secondary, when they migrate to it in the adult stage, generally from cereals, grass or bushes that have been harvested or cut down. The geographical distribution in France of recent attacks by various species is discussed, with a key to those known to attack the vine, namely *U. rugosicollis*, *E. provincialis*, Yers., *E. terrestris*, Yers., *E. ephippiger* and *E. biterrensis*, Marq. The control measures advocated are similar to those already noticed [*loc. cit.*].

Pyrausta nubilalis **nuisible aux chrysanthèmes.**—*Rev. Zool. agric.*, xxix, no. 5, p. 80. Bordeaux, May 1930.

Pyrausta nubilalis, Hb., is recorded as infesting chrysanthemum in France, 40 per cent. of the plants being sometimes attacked. The female lays 1–3 eggs at the junction of a branch, and the larva penetrates into the stem a few days after hatching, devouring the pith, usually from the bottom to the top.

Fulmek (L.). **Der Erdbeerwurzelrüssler** *Otiorrhynchus* (*Pendragon*) *ovatus* **L.** [The Strawberry Root Weevil, *O. ovatus*.]—*GartenZtg.*, Vienna, 1930, reprint 3 pp.

Pine strawberry plantations at Wiesen, Austria, are infested by *Otiorrhynchus ovatus*, L. [*cf. R.A.E.*, A, xix, 51], the greatest injury being done in the spring by hibernated larvae. Some adults hibernate and oviposit in spring, so that larvae of all stages occur together. Measures must be directed against the adults. They may be collected in May–July by means of slabs of turf placed upside down close to the strawberry plants, and migration may be prevented by trenches with quicklime at the bottom, or boards partly embedded in the ground and covered with a banding adhesive [*cf. loc. cit.*]. Poison-baits used in Oregon are described [xvi, 23, 24]. Infested plants should be carefully uprooted and buried with quicklime, and the soil may be disinfected with carbon bisulphide. Old infested plots should be cleared and kept free from weeds in the winter so as to expose the insects to unfavourable conditions during hibernation.

Miestinger (K.). **Neuere Erfahrungen über die Bekämpfung der Traubenwickler.** [Modern Experience on the Control of Vine Moths.]—*Das Weinland*, 1930, no. 5, p. 170 (reprint 2 pp.). [? Vienna] May 1930.

The successful control of vine moths [*Clysia ambiguella*, Hb., and *Polychrosis botrana*, Schiff.] depends on the timing of the sprays or dusts. The correct date may be ascertained by means of trap-glasses baited with sweetened wine and water, or by searching for the eggs. Very good results have been obtained in Austria with a mixed spray containing Paris green, Bordeaux mixture, and $1\frac{1}{2}$–2 per cent. tobacco extract.

Zacher (F.). **Untersuchungen zur Morphologie und Biologie der Samenkäfer (Bruchidae-Lariidae). Beiträge zur Kenntnis der Vorratsschädlinge. 6. Beitrag.** [Investigations on the Morphology and Biology of the Seed Beetles. Contributions to the Knowledge of Pests of Stored Products. 6th Contribution.]—*Arb. biol. Reichsanst.*, xviii, no. 3, pp. 233–384, 99 figs., 206 refs. Berlin, October 1930.

A detailed account is given of the results of investigations on Bruchids infesting leguminous seeds in storage, in connection with a severe infestation of beans in Germany by *Spermophagus* (*Zabrotes*) *subfasciatus*, Boh., an introduced species. Its morphology and biology are discussed at length. Other species dealt with are *Bruchus* (*Acanthoscelides*) *obtectus*, Say, *B. analis*, F., and *B. chinensis*, L., which

are often found in imported seeds in Germany, and *B. dentipes*, Baudi, and *B.* (*Bruchidius*) *incarnatus*, Boh. Chapters are devoted to oviposition, egg-development, larval life, seeds attacked, dependance of duration of development on temperature and food, experiments on the effect of cold on *S. subfasciatus*, adult life in its various aspects, parasites, diseases, and experiments in control by means of gases and contact dust insecticides. The data obtained indicate that *B. obtectus* could become established in the warmer parts of Germany.

SPRENGEL (L.). **Stand der Kenntnisse über die biologische Bekämpfung der Blutlaus (*Eriosoma lanigerum*, Hausm.) mit *Aphelinus mali* Hald. in Europa.** [The Position of Knowledge on the biological Control of the Woolly Aphis by *A. mali* in Europe.]—*Gartenbau-wiss.*, iv, no. 1, pp. 11–37, 9 figs., 36 refs. Berlin, 1930.

A brief history is given of the introduction of *Aphelinus mali*, Hald., against *Eriosoma lanigerum*, Hausm., in various European countries during the past ten years, with notes on its biology and methods for artificial dissemination. A survey of the results achieved leads to the conclusion that *A. mali* often tends to disappear from orchards in which it is liberated, and that in districts where fruit of high quality is grown, large-scale breeding and frequent liberation of the parasite may be advisable.

[GROSSHEĬM (N. A.).] **Гроссгейм (Н. А.). Trap-bands on Fruit Trees.** [*In Russian.*]—*Bull. Mleev Hort. Expt. Sta.*, no. 24, 79 pp., 24 figs., 27 refs. Mleev, 1929. (With a Summary in English.) [Recd. 1930.]

An account is given of experiments carried out in the Ukraine from 1923 to 1928 on the effectiveness of various types of trap bands for the control of orchard pests. A list of the insects collected is given. Straw bands were the most effective in early spring against the over-wintered generation of *Anthonomus pomorum*, L., but in June the young weevils readily sheltered in packing shavings, straw or rags, the rags being definitely preferred in July and August, and during the winter months shavings covered with paper gave the best results, followed by straw, alone or covered with paper, and shavings alone. The few data obtained on *Cydia pomonella*, L., which was very scarce, indicated that the larvae shelter chiefly in sacking or in shavings covered with paper. *Sciaphobus squalidus*, Gyll., and *Rhynchites pauxillus*, Germ., preferred shavings and straw, and *Coleophora badiipennella*, Dup., occurred chiefly in shavings in summer and in sacking in winter. The Coccinellids sheltered in the spring and autumn in bands of shavings or straw (alone or covered with paper), and most of the parasitic Hymenoptera occurred in these bands. *Chrysopa vulgaris*, Schn., decidedly preferred bands of coarse paper, but also occurred in those of other types provided that they were covered with paper.

For hibernation most of the insects chose the higher parts of the orchards, avoiding low, damp places. Individual species preferred different kinds of trees, not necessarily their own food-plants. Old trees with rough, moss-covered bark were especially favoured, and banding them is of particular value. *A. pomorum* overwintered chiefly on pear

trees, followed in the order of preference by apple, cherry and plum, whereas *R. bacchus*, L., avoided pear and concentrated on stone-fruits, especially plum. The Coccinellids hibernated on all kinds of fruit trees, wherever Aphids had been present in autumn.

The correct dates for the application of bands for individual species of insects are discussed. In testing the best place for application, the bands were fixed at the foot of the tree, 14 ins. above the ground, immediately below the first branches, and on the lower tier of branches. *A. pomorum* concentrated in the spring and summer in bands on the branches, and from the end of August in those at the foot of the tree. *C. pomonella* was found chiefly on the branches, and *S. squalidus* showed no preference for any particular height. *R. pauxillus* usually occurred in the bands 14 ins. above the ground or in those immediately below the first branches. *C. badiipennella* appeared to shelter in spring in bands on the branches, and in the autumn at the foot of the tree. *R. bacchus* occurred in the lowest bands, near the soil. In March-April the Coccinellids preferred bands at the foot of the tree, in May-July they concentrated on the branches, and in August-September were found in approximately equal numbers at all heights, but for hibernation they decidedly preferred bands near the ground. *C. vulgaris* and the parasitic Hymenoptera were most numerous in bands on the branches.

[Rekk (G. F.).] **Рекк (Г. Ф.). Works with Paradichlorobenzene during the Summer [of] 1929, in Reference to young Fruit Trees. (Preliminary Information.)** [*In Russian.*]—*Bull. Mleev Hort. Expt. Sta.*, no. 27, 30 pp., 36 refs. Mleev, 1930. (With a Summary in English.)

In the summer of 1929, paradichlorobenzene was applied against the larvae of *Melolontha melolontha*, L., *Polyphylla fullo*, L., and *Anoxia pilosa*, F., in orchards in the Ukraine. Eight methods of application were tried, and these are briefly described, the fumigant being introduced at a depth of about 4 ins. Fumigation in rings round individual trees was very effective, and examination of the soil showed that the larvae of *Melolontha* and *Anoxia* concentrated near the chief root and root collar of both young and old trees, as many as 150 larvae of *Anoxia* being sometimes found below individual trees in old orchards.

All the larvae of *Melolontha* and *Polyphylla* were killed in 48 days when the fumigant was applied in two concentric rings round each tree, at a radius of 6–8 and 18 ins. for *Melolontha*, and 6 and 14 ins. for *Polyphylla*. A dose of about 3 oz. to an average five-year-old cherry tree was sufficient against *Melolontha*, and half this quantity to each small apple tree was effective against *P. fullo*, about a third of the total amount being used in the inner ring. All the larvae of *A. pilosa* were killed in 55 days by a dosage of about ½ oz. to each small cherry tree applied in a single ring at a radius of 4–6 ins., or of rather less inserted in four holes each at a distance of 2–3 ins. from the tree. The smallness of the quantity effective against *A. pilosa* is explained by the fact that the plantation was much further to the south and in a warmer climate. In cases of severe infestation, the treatment should be repeated in the course of the summer. Considerable economy in cost and labour is attained by fumigation in rings, as compared with

the treatment of the whole area of an orchard by the method of Golo vyanko [*R.A.E.*, A, xvi, 293].

Experiments showed that the evaporation of the fumigant is retarded in cold or moist soil or in plots protected from the wind by a cover of moss or grass, and by as much as 58 per cent. in shaded plots. Covering the treated plots with a thin layer of lime or sand retarded evaporation by almost 50 per cent., which suggests that in light coloured soils that do not readily absorb the heat of the sun, paradichlorobenzene would evaporate more slowly. A larger amount of fumigant takes longer to evaporate and may therefore be used to prolong the process. The correct time of application depends on the soil and climatic conditions ; in these experiments good results were obtained at the end of May [*cf.* xvii, 306]. The trees were not affected by the fumigant, even when as much as $5\frac{1}{4}$ oz. of paradichlorobenzene was used to a two-year-old cherry tree.

[Tzuigankov (S. K.).] **Цыганков (С. К.). Sooty Mould of Cotton and its Control.** [*In Russian.*]—*Khlopkovoe Delo*, ix, no. 9, pp. 1070–1078, 6 figs., 6 refs. Tashkent, September 1930.

In Central Asia, *Aphis gossypii*, Glov., is responsible for the development of sooty mould on cotton, the honey dew produced by the Aphids favouring the growth of the fungus concerned. The latter usually appears in July on the lower leaves and gradually spreads as the Aphids move to the upper parts of the plants, the cotton in the opened bolls being affected in early September.

Field experiments with insecticides against the Aphids were carried out in the first half of September 1929, the concentrations used being rather high in order to study their effect on the cotton fibre. Sprays of 4 per cent. soap or tobacco extract, 1 : 3,000, and a nicotine dust combined with flowers of sulphur were applied at the rate of 180 gals. and 500 lb., respectively, to the acre. Complete mortality was not obtained, though infestation of the leaves decreased on an average by about 50 per cent. The sprays were applied from below, and a considerably higher percentage of the Aphids was killed on the middle and lower leaves. It was found that the insecticides did not affect the quality of the cotton fibre, the soap solution being even beneficial, but though the plants could therefore be treated when the bolls are open, it would be more economical to treat them before the fungus had spread to the bolls. The part of the plants on which the Aphids occur should be determined, as this affects the method of applying the insecticide and the quantity required. If *A. gossypii* and the mite [*Tetranychus telarius*, L.] occur together, preference should be given to soap solution or the nicotine dust combined with flowers of sulphur.

[Rekach (V. N.).] **Рекач (В. Н.). Preliminary Report on the Study of the Cotton Owlet Moth,** *Chloridea obsoleta* **F., in 1929.** [*In Russian.*]—*Khlopkovoe Delo*, ix, no. 9, pp. 1079–1098, 17 figs., 4 refs. Tashkent, September 1930.

Observations were carried out in two areas in Azerbaijan in 1929 on the status of *Heliothis* (*Chloridea*) *obsoleta*, F., as a cotton pest. Four generations occurred during the year in each area. In one of them, *Cicer arietinum* is extensively cultivated and the larvae concentrated on it, infestation rising to 84 per cent., as compared with a

maximum of 8·5 per cent. on cotton. In the other area cotton was attacked by the larvae of the second generation about the end of June, infestation reaching 33 per cent. about mid-July ; the third generation infested 27 per cent. of the plants, and the fourth 15 per cent. In Azerbaijan the larvae of the second generation are usually the most numerous [*cf. R.A.E.*, A, xvii, 3], and those of the fourth are always scarce.

Laboratory and field observations on the damage caused to cotton showed that in 32 per cent. of the cases observed the larvae fed on buds, flowers and ovaries without damaging the bolls ; in the other cases the larvae of the last two instars injured the bolls, each larva almost always damaging one boll only. Usually not more than two locules are attacked, and sometimes the remaining locules open and produce normal fibre. It was found that on an average a larva injured 12–14 per cent. of the buds, flowers and fruit on a plant. The damage was chiefly caused on the upper and outer parts of the plant, where the buds and flowers are particularly liable to drop. As the ripe bolls occurred near the main stem, this injury had no effect on the productive capacity of the plants. Moreover, if the flowers or bolls near the stem were damaged, those on other parts of the plants were rendered more vigorous and able to develop, whereas under ordinary conditions they would have fallen off. Plants that were in good condition could harbour several larvae without the yield of cotton being decreased. With a view to determining the importance of *H. obsoleta* under local conditions, a small plantation of cotton was cultivated according to the methods used by the peasants, and buds, flowers and bolls were at various dates removed from individual plants to correspond with the average injury caused by the larvae. It was found that an infestation of one larva to each plant results in a loss of about 50 lb. of the crop per acre, the average yield being 2·6 cwt.

Experiments showed that dusts are effective if applied during the period of 2–5 days when the young larvae are feeding on the leaves and before they penetrate into the buds or flowers. Paris green or calcium arsenate at the rate of about 22 lb. to the acre killed 95–98 per cent. of the larvae of the first and second instars. The addition of freshly slaked lime to Paris green, 1 : 1, did not decrease the effectiveness of the dust, but retarded the results by approximately 24 hours. In cases of a severe infestation or protracted oviposition, dusting should be repeated in about 10 days. As, however, dusting is too expensive under local conditions, special attention should be given to improved cultivation in order to raise the resistance of the plants to infestation.

The author is inclined to think that the economic importance of *H. obsoleta* as a pest of cotton has been somewhat overrated. A high yield of cotton may be obtained even from severely infested fields, owing to the peculiar reaction of the plants to the injury caused.

Colony and Protectorate of Kenya : The Diseases of Plants Prevention Rules 1930 and the Diseases of Plants Prevention (Coffee) Rules, 1930.—12 pp. Nairobi, 1930. Price 1*s.*

In the second section of these rules provision is made for controlling the movement of coffee from one area to another, and the importation of coffee plants or raw coffee is prohibited, except under certain

fixed conditions. Powers are given for the inspection of land on which coffee is growing, and for the enforcement of measures against pests. By dates notified for various areas all coffee must be stripped from the trees and collected from the ground, etc., and disposed of. All coffee infested with *Stephanoderes* [*hampei*, Ferr.] or *Sophronica* sp. must be immediately burnt or otherwise treated. No coffee pulp or refuse may be used on coffee plantations until it has been rotted for sufficient time to ensure the death of any living beetles of *Stephanoderes* and the destruction of any eggs present. No coffee seed may be disposed of unless it has been inspected. All warehouses in which coffee is stored are placed under regulation for the control of pests. No coffee may be moved except in standard coffee bags, which are described.

[**Legislation respecting Noxious Weeds and Pests and Diseases of Plants in Fiji.**]—*Fiji Roy. Gaz.*, no. 64, pp. 470–475. Suva, 1930.

Various regulations, proclamations and notifications provide for the restriction of the import of plants and plant products coming into Fiji, the inspection of plantations, the regulation of cotton cultivation, and the eradication of noxious plants.

Harukawa (C.) & Kumashiro (S.). **On the Pear-bark Miner,** *Acrocercops astaurota* **Meyrick. I.**—*Ber. Ōhara Inst. landw. Forsch.*, iv, no. 4–5, pp. 475–494, 3 pls., 3 refs. Kuraschiki, 1930.

An account is given of observations on *Acrocercops astaurota*, Meyr., carried out since 1927. This Tineid is fairly widely distributed in Japan, attacking pear, Japanese pear (*Pyrus pyrifolia*), apple, plum and other Rosaceae. The larvae mine and pupate in the green tissues of the bark, affecting the nutrition of the trees and sometimes killing young trees of certain varieties of Japanese pear. There are two generations a year near Kuraschiki; the partly grown larvae of the second overwinter and begin to spin their cocoons in the second half of May, the adults emerging towards the end of June. The larvae of the first generation occur from early July to mid-August, and those of the second begin to feed about 10th September. The average number of eggs per female is about 50. The egg stage of the first generation lasts about 7 days and of the second 8–13, the larval stage about 40 and 260–270, and the pupal stage about 19 and 24. Feeding may occur, even during the coldest part of the winter, if the orchard is in a warm, sunny place.

Harukawa (C.) & Kumashiro (S.). **On the Bionomics of the Larger Black-male Saw-fly,** *Dolerus harukawai* **Waterston.**—*Ber. Ōhara Inst. landw. Forsch.*, iv, no. 4–5, pp. 495–509, 2 pls., 8 refs. Kuraschiki, 1930.

An account is given of the bionomics of *Dolerus harukawai*, Wtrst., which infests the cultivated rush, *Juncus effusus* var. *decipiens*, in Japan, without causing serious damage. All stages of this sawfly are described, and the characters distinguishing it from other species

of the genus are indicated. There is one generation a year, the adults appearing about mid-April, and the larvae between early May and mid-June. The female lays 70–80 eggs. The full-grown larva pupates in the ground, but cannot do so in the soil of a flooded rush-field, so that the sawflies are more abundant in fields near an embankment or other suitable place for pupation. The mature larva in the pupal case passes the summer in a state of arrested development. Development is resumed following exposure to low temperature.

DAVIDSON (J.). **White Grubs.**—*J. Dept. Agric. S. Aust.*, xxxiv, no. 3, pp. 224–227, 2 figs. Adelaide, 15th October 1930.

Considerable damage by Melolonthid larvae has been recorded recently in pastures and cereal crops in the south-east of South Australia and in the hills of Adelaide. Swarms of the beetles sometimes occur in early summer and attack vines or the foliage of orchard trees, the genera most frequently met with in South Australia being *Heteronyx*, *Diphucephala*, *Scitala* and *Anodontonyx*. A general account is given of the life-cycle of Melolonthids and of the control measures employed against them.

JOHNSON (W. C.). **The Occurrence of the Red Legged Earth Mite (*Penthaleus destructor*, Jack) in South Australia.**—*J. Dept. Agric. S. Aust.*, xxxiv, no. 3, pp. 283–285, 4 figs. Adelaide, 15th October 1930.

Halotydaeus (*Penthaleus*) *destructor*, Tuck. (red-legged earth mite), which is a well-known pest in Western Australia [*R.A.E.*, A, xviii, 139, 464, etc.], has recently been discovered in South Australia. A brief account is given of its bionomics.

LEEFMANS (S.). **Voorloopig bericht over den import van *Calosoma sycophanta* L. (De poppenroover) in Nederlandsch Indië.** [Preliminary Report on the Importation into the Dutch East Indies of *C. sycophanta*, a Predator on Pupae.]—*Tectona*, xxiii, pp. 913–918. Buitenzorg, November 1930. (With a Summary in English.)

With a view to its utilisation against various Lepidopterous pests that occur in forests and on *Cinchona* in the Dutch East Indies, the Carabid, *Calosoma sycophanta*, L., was imported from South Germany into Java in December 1929. Of 72 adults shipped in cold storage, 17 were landed alive and were kept until early January 1930 in a cool chamber at Buitenzorg and then gradually (in a month) brought to a tropical temperature. They fed on larvae and pupae of the Anthribid, *Araecerus* (*Araeocerus*), and caterpillars of Hesperiids and a Pierid, and began to oviposit early in February. In Germany they hibernate from September to May. One of the imported females laid 480 eggs between 5th February and 18th March, and many of these hatched. At Buitenzorg the egg stage lasted 4 days, the larval 20–32, the pupal 7–9, and the resting period of the adult in the pupal case 2–13. The adults that emerged in March and April had not reproduced at the date of writing; apparently a cold period or the lapse of a certain length of time is required.

Betrem (J. G.). **Koffie en insecten.** [Coffee and Insects.]—*De Bergcultures*, iv, p. 1012 (reprint 6 pp., 5 figs.). [? Batavia] 20th September 1930.

The influence of environmental factors on insects is discussed in general, and a brief account is given of the insects and ecological factors affecting *Coccus* (*Lecanium*) *viridis*, Green, *Xyleborus morigerus*, Bldf., and *X. morstatti*, Hag., infesting coffee in the Dutch East Indies.

Kunhikannan (K.). **The Annual Administration Report of Work done in the Entomological Section during 1928-29.**—*Ann. Rep. Agric. Dept. Mysore 1928–29*, pp. 29–33. [Bangalore, 1930.]

There was a severe outbreak of the jola grasshopper [*Colemania sphenarioides*, Bol.] and the rice grasshopper [*Hieroglyphus banian*, F.] in various localities in Mysore. The final result of work done on the avare pod borer [*Adisura atkinsoni*, Moore] could not be estimated owing to a drop in the temperature in the third week of December, which caused shrivelling of the pods, flowers and leaves of avare [*Dolichos*]. It is thought probable that this moth pupates in fallow land. The number of hand-picked adults of the coffee-borer [*Xylotrechus quadripes*, Chevr.] shows a decrease during recent years. Experiments to trap the beetles by painting the stems with an adhesive had to be abandoned owing to its harmful effect on the trees. A fish poison, Mundulea, is effective against Aphids and mango hoppers [*Idiocerus*] and is highly toxic to mosquito larvae.

Jepson (F. P.). **The Control of Tea Termites.**—*Trop. Agriculturist*, lxxv, no. 4, pp. 191–195. Peradeniya, October 1930.

The termites that are of importance as pests of tea in Ceylon are, with few exceptions, species that nest above ground; they include *Calotermes militaris*, Desn., *C. dilatatus*, Bugnion & Popoff, and *C. greeni*, Desn. Bushes attacked by the first-named are completely hollowed out. *C. dilatatus* forms a system of galleries in the branches and upper parts and only descends to soil level in advanced cases of attack. *C. greeni*, the galleries of which are larger and more extensive than those of *C. dilatatus*, is probably the most widely distributed species of the genus in Ceylon, but least common in tea, *Grevillea* being often killed by it. These termites, which are undoubtedly on the increase, are responsible for considerable capital depreciation of tea estates.

Most of the information on the treatment of infested bushes with Paris green has already been noticed [*R.A.E.*, A, xviii, 105]. As the entrance of *Calotermes* to woody plants is effected by the winged stages through decayed wood, and the periodical pruning of tea bushes leads to the dying back of some of the pruned branches, up to the sound wood, the removal of dead and diseased wood is essential. The author is of the opinion that if diebacks, the causes of which need immediate investigation, can be prevented, the problem of *Calotermes* control will automatically be solved.

Boselli (F. B.). **Studii sugli Psyllidi. viii. Biologia e sviluppo della** *Rhinocola succincta* **Hegeer.** [Studies on Psyllids. viii. Biology and Development of *Rhinocola succincta.*] **ix. Descrizione di una Triozina galligena su agrumi in Eritrea.** [ix. Description of a Triozine causing Galls on *Citrus* in Eritrea.]—*Boll. Lab. Zool. Portici*, xxiv, pp. 211–222, 5 figs., 6 refs ; pp. 228–232, 2 figs. Portici, 1930.

The first paper describes the morphology of all stages and biology of *Rhinocola succincta*, Heeger, infesting common rue (*Ruta graveolens*) near Naples. The second describes the adult and pupa of *Trioza* (*Spanioza*) *erythreae*, Del Guerc., which produces leaf-galls on *Citrus* in Eritrea.

Giffard (W. E.). **The Sudan Bollworm** (*Diparopsis castanea*, **Hamp.**) **in the Sudan.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 27, 17 pp., 2 pls., 1 map, 2 refs. Khartoum [? 1929]. [Recd. December 1930.]

An account is given of the distribution and bionomics of *Diparopsis castanea*, Hmps., on cotton in the Sudan [*cf. R.A.E.*, A, xvi, 167], and all its stages are described. Most of the observations discussed were made at Shendi in Berber Province. The eggs are deposited, usually singly, on practically any part of the cotton plant, moths in the insectary laying 10–20 a night. From August to October the egg stage lasts 4–8 days, and from November to March 6–11. The young larvae cause severe shedding by tunnelling through the flowers, buds and young bolls, and the more mature ones attack the larger bolls, which they hollow out, a nearly mature boll providing sufficient food for the larva to complete its development. Fungous spores may enter and attack the boll through the hole left by the mature larva. The average length of the larval stage in captivity during the short cycle period (late July-October) is about 17 days with a minimum of 14, and during the remainder of the season it lengthens to an average of rather over 3 weeks and may be prolonged to 4. The length of the pupal period is extremely varied. Most of the larvae pupating early in the season become adult in 13–25 days, though it appears probable that some may adopt a definite resting stage. From the end of October to March, the period is gradually lengthened and the proportion of larvae adopting a prolonged pupal stage is increased. In the laboratory emergence of adults from resting pupae occurred throughout the year, except from 24th April to 16th July, the majority emerging during August and September.

The numbers of *D. castanea* present in the field rapidly increase from the beginning of August to mid-November and continue increasing slightly till mid-January, when the bulk of the crop should be coming in. Then there is a rapid decrease, owing to the majority of larvae that pupate at this time remaining as pupae until the next season's crop is in flower. In the author's opinion there is a greater loss at Shendi when cotton is infested by *D. castanea* than by *Platyedra gossypiella*, Saund. (pink bollworm).

Attempts to destroy the pupae in April-May by ploughing to a depth of 6 ins. were unsuccessful. Pupae exposed to the sun are killed, but some survived when covered by an inch of soil. Complete control

could probably be effected over small areas by collecting the eggs and by trapping the moths at light, but over large ones the cost would be prohibitive.

[KING (H. H.).] **Report of the Government Entomologist for the Year 1928.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 29, 6 pp., 1 map. Khartoum, January 1929. [Recd. December 1930.]

The numbers of *Schistocerca gregaria*, Forsk., appearing in the Sudan in 1928 were less than in the previous year. Few hoppers were allowed to mature except in certain sparsely populated areas, but swarms from these places caused serious damage and spread to other districts. Injury was caused to cotton and particularly to grain crops and grazing. The return migration started in September and continued until the latter half of November [see next paper]. Dried poison bait [*R.A.E.*, A, xvii, 507] was used on a large scale with successful results.

A brief account is given of work on *Platyedra gossypiella*, Saund., in the Gezira area [xviii, 56]. The situation regarding it has remained normal in other districts, except in one where its numbers appeared to be increasing at the end of the year. An additional host of its parasite, *Microbracon kirkpatricki*, Wlkn. [*cf.* xviii, 100] is a Lepidopterous larva that feeds in the seed heads of *Abutilon*, a common weed.

It was found that the principal cause of the heavy mortality of the pupae of *Selenothrips* (*Heliothrips*) *indicus*, Bagn. (cotton thrips) [*cf.* xviii, 100] is the mechanical action of irrigation water in sealing the pupae in the soil. Local attacks of this thrips might be controlled by watering the crop when the pupae are in the soil, as only those that occur in the ridges and so escape submersion survive. The soil should be watered early in the season; later, when the broods overlap, the effect is not so well marked. Two larval parasites of this thrips have been recorded. They occur in November, and one is believed to exercise some degree of control. Under certain conditions the thrips breed freely on *Dolichos lablab* and might migrate to cotton. Where *Dolichos* produces a dense and luxuriant growth and receives sufficient and regular watering, the numbers of thrips on it remain at a minimum.

Dura [*Sorghum*] was not severely infested by *Agonoscelis versicolor*, F., in 1928, though it was very numerous during the preceding winter. A spraying campaign was carried out early in the year against the bugs when clustering in trees [*cf.* xvii, 657]; 6,760 gals. of paraffin were used and it is estimated that 130,000,000 bugs were destroyed. When in a semi-dormant condition, they appear to require a certain degree of humidity, and it is probable that, except in years when the humidity remains relatively high throughout the dry season, only a small proportion survives. The eggs are attacked by a Hymenopterous parasite, which is believed to have destroyed about 60 per cent. *Sesamia cretica*, Lederer, which is one of the worst pests of *Sorghum* and maize grown under irrigation, usually breeds while the flood and winter crops are on the ground; it spends the early summer as a resting larva in *Sorghum* stalks stored as cattle fodder and in the root-stocks of the old crop.

King (H. H.). **The Desert Locust,** *Schistocerca gregaria,* **Forsk.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 30, 15 pp., 1 map. Khartoum, April 1930.

Particulars are given of the seasonal occurrence in the Sudan of *Schistocerca gregaria,* Forsk. [*R.A.E.*, A, xvii, 507], and the bionomics and appearance of the hoppers of ph. *solitaria,* which may be met with at all seasons throughout the central and northern provinces of the Sudan, are compared with those of ph. *gregaria* [*cf.* xiv, 571].

There is reason to believe that all migrating swarms of *S. gregaria* follow definite routes, the progeny returning to the district whence their parents came. Thus most of the swarms that come to the Sudan for summer breeding seem to arrive from the east, apparently from Abyssinia, Eritrea or Arabia, and from the north-north-west, possibly from Libya and further westwards, and the progeny of these swarms, which reach maturity in October-November, return in the direction of their origin.

Natural enemies of the adult locusts include various mammals and birds, lizards, snakes, and the more powerful predacious insects. The eggs are attacked by the larvae of at least one species of blister beetle, and the hoppers and adults are parasitised by several species of Diptera.

The use of a poison bait [xvii, 507], which is considered to be the control measure best suited to local conditions, is described.

Ripley (L. B.) & Hepburn (G. A.). **A Menace to the Fruit Industry : "Bug-tree" harbours Fruit-fly.**—*Fmg. S. Afr.*, 1930, reprint no. 72, 2 pp., 1 fig. Pretoria, October 1930.

The "bug-tree" (*Solanum auriculatum*), which was originally accidentally imported from South America, has spread practically throughout Natal and is close to the Cape border. It constitutes a serious menace to the fruit industry, as it not only harbours the Natal fruit-fly [*Ceratitis rosa,* Ksh.] but is apparently often the only fruit that is available to enable it to survive the winter. During the cold months, the flies feed on the fruits without breeding in them, but in early spring they begin to oviposit on the fruit, and one or two generations develop before the earliest cultivated fruits are ready for attack. They then migrate to orchards, as the fruits of *S. auriculatum* fall off in numbers. The plant is also carrying the fruit-fly with it as it spreads. When cut down, it quickly ratoons, but no fruit is borne for two years or more, and it is therefore suggested that cutting down every two years, or better still, every year, would be the only way to check its spread. Eventual eradication does not seem impossible if all growers would work in co-operation.

Garlick (W. P. G.). **Insects affecting the Raspberry.**—*Bull. Dept. Agric. Canada,* no. 114, pp. 18–23, 1 pl., 4 figs. Ottawa, 1929. [Recd. December 1930.]

Notes are given on the bionomics and control of the following pests of raspberry in Canada : *Typophorus* (*Paria*) *canellus,* F., *Byturus unicolor,* Say, *Monophadnus* (*Monophadnoides*) *rubi,* Harr., *Tetranychus telarius,* L., *Oberea bimaculata,* Ol., *Phorbia rubivora,* Coq., *Oecanthus nigricornis,* Wlk., *Agrilus ruficollis,* F., *Pennisetia* (*Bembecia*) *marginata,* Harr., and *Aulacaspis rosae,* Bch.

Headlee (T. J.). **Report of the Department of Entomology.**—*Rep. New Jersey Agric. Expt. Sta. 1928–29*, pp. 125–207, 1 fig. New Brunswick, N.J., 1930.

This is a detailed account of investigations on the control of a number of injurious insects, conducted in New Jersey during 1928–29. Comparison of the dates indicated by the thermal constant method of determining when the sprays against the codling moth [*Cydia pomonella*, L.] should be applied [*cf. R.A.E.*, A, xvii, 668], with the actual dates of the emergence of the moths, showed that as a rule the difference between them did not exceed one day. Experiments in April show that a spray of miscible pine-tar oil (pineole soluble) 1 : 1 [*cf.* xvii, 669], applied at the rate of 1½ U.S. gals. to each tree before pupation takes place, will destroy 100 per cent. of the overwintered larvae. Tests indicated that oil emulsions combined with cresylic acid or cresol may be of considerable value in early spring against the overwintering eggs of *Aphis pomi*, DeG., and *Anuraphis roseus*, Bak. (*Aphis sorbi*, auct.) on apple. In June in both 1927 and 1928 winged forms of *A. pomi* appeared on the terminal shoots of the trees in apple orchards that were previously free from infestation. Infestation during the latter year, however, was checked by Coccinellids [*cf.* xvii, 668]. In experiments designed to reduce the high cost of controlling this Aphid by increasing the efficiency of nicotine extract, very satisfactory results were obtained with a spray of ⅓ U.S. pint 40 per cent. free nicotine and 6 lb. potassium oleate soap (40 per cent. water), to 100 U.S. gals. water. Several applications may be necessary to prevent the leaves from being curled.

The newly hatched larvae of *Zeuzera pyrina*, L., which has become increasingly injurious to apple, enter the twigs of the preceding or the current year's growth, where they feed until they become too large for the twigs. They then emerge at night and enter larger parts of the branches. Painting the entrances to the burrows with miscible pine-tar oil proved of value, provided that the burrows did not exceed a depth of 2 ins. The addition of volatile materials, especially naphthalene, nicotine or benzyl chloride, to the oil, which was then applied with a paint brush or by injection, rendered it effective against larvae in deeper burrows. The adoption of this measure when the foliage is on the tree is probably impracticable, but its use in the dormant season should be of value, though further tests are required to determine its effect on the dormant buds.

Tests were made in which soil mixed with naphthalene in various proportions was placed in separate pans, and wireworms were introduced into the top soil. The results indicate that at temperatures of 70° F. or higher they are killed in soil mixed with naphthalene at the rate of 3,000 : 1. Another experiment against wireworms has already been noticed [xviii, 410].

Driggers (B. F.). **Oriental Peach Moth.**—*Rep. New Jersey Agric. Expt. Sta. 1928–29*, pp. 150–167. New Brunswick, N.J., 1930.

In further laboratory experiments [*cf. R.A.E.*, A, xvii, 669] against the oriental peach moth [*Cydia molesta*, Busck], highly refined white oil emulsions with differing pyrethrum contents were tested against the eggs and the larvae. The impregnated oils were emulsified at

the rate of $\frac{2}{3}$ oil, $\frac{1}{3}$ water and 1–2 per cent. dry skim milk. Before use the emulsions were diluted with water so that the spray contained 0·5 per cent. actual oil. The highest percentage of mortality of the eggs (79·5) was obtained when the pyrethrum content was equivalent to 23·9 gm. of flowers to 100 cc. oil, higher or lower concentrations being less effective. The greatest mortality among the larvae (64·8 per cent.) was obtained with the oil of the lowest pyrethrum content (5·8 gm. to 100 cc.). In similar tests in which the oil emulsions were impregnated with other chemicals, the best results against both the larvae and the eggs were obtained when nicotine oleate (10 gm. to 100 cc. oil) was used in sprays containing 0·5 and 1·0 per cent. actual oil, the total percentage of both larvae and eggs killed by these two sprays being 82·0 and 88·8 respectively. Further tests with various dusts used as mechanical barriers against the young larvae of *C. molesta* are discussed [xvii, 447]. Field tests show that talc and hydrated lime remained on the foliage until washed off by heavy rains, whereas mica adhered very badly and was blown off by wind. Field tests with white oil emulsions having a pyrethrum content equivalent to approximately 24 gm. pyrethrum flowers to 100 cc. oil were conducted in two peach orchards against the eggs and young larvae of the third generation of the moths. In both instances the first application was made with a spray containing 1·0 per cent. of actual oil, whereas the three subsequent sprays in the first orchard and the four sprays in the second orchard, applied at intervals of a week between each, contained 0·5 per cent. actual oil. In the first orchard the amount of injury to the fruit was 40 per cent. as against 46·5 on the unsprayed trees. In the second, the injury was 37·6 per cent. as against 25 on trees that were dusted at weekly intervals with sulphur. Failure to obtain greater amounts of uninjured fruit was in both instances probably due to the fact that the amount of oil in the sprays was not sufficiently great to maintain the oil coating on the fruit and foliage throughout the experiments.

Observations on overwintering larvae show that considerably more adults emerge from cocoons under a shed than from those left in fully exposed situations on the ground. Somewhat fewer moths emerged from cocoons placed on soil heavily covered with grass than from those on clean cultivated ground. This was probably due to the fact that the partly covered cocoons were more liable to infestation by fungi. Experiments in the northern part of the State indicate that parasitism of the larvae by *Macrocentrus ancylivora*, Roh., and *M. delicatus*, Cress., could be considerably increased by liberating these parasites during July-September. *M. ancylivora*, which in the southern part of the State is found in the first larvae of the first generation, was almost entirely absent in the larvae of the first generation during these experiments.

HAMILTON (C. C.). **Twig, Leaf, and Fruit Growth of Baldwin and Grimes Golden Apple Trees with Respect to the Time of Spraying.**—*Rep. New Jersey Agric. Expt Sta. 1928–29*, pp. 167–173, 1 ref. New Brunswick, N.J., 1930.

Experiments with two varieties of apples show that a rapid increase in twig length, number of leaves, and leaf area occurs during the period when the first three sprays are normally applied, that is, from

the petal-fall spray to the 17-day spray. Therefore, if a spray coating is to be maintained upon the foliage at this time, it will be necessary to spray either very thoroughly or more frequently. As the percentage of the total diameter of the apples developed during this period is small, any lead arsenate deposited would be small in relation to the total volume and weight of the fruit at picking time.

GINSBURG (J. M.). **Summer Oil Sprays and their Effect on Apple Trees.**—*Rep. New Jersey Agric. Expt. Sta. 1928–29*, pp. 173–176, 5 refs. New Brunswick, N.J., 1930.

It was found that apple trees that had received oil sprays preceded or followed by sulphur dusts showed injury, whereas those treated with oil or sulphur alone were not injured. Four applications of a spray of 0·5 per cent. highly refined oil containing pyrethrum extract, casein-lime being added at the rate of 1½ lb. to 200 U.S. gals. as a spreader, gave excellent control against the first generation of the codling moth [*Cydia pomonella*, L.] and caused no appreciable injury to the foliage. The oil was emulsified with either powdered skim milk or alcoholic potash soap, and copper oleate was used in some of the sprays as a possible fungicide to replace sulphur. In no case was any definite injury observed. The foliage assumed a richer green colour than that on the unsprayed trees [*cf. R.A.E.*, A, xvii, 449].

BURDETTE (R. C.). **The Mexican Bean Beetle.**—*Rep. New Jersey Agric. Expt. Sta. 1928–29*, pp. 180–184. New Brunswick, N.J., 1930.

Although the Mexican bean beetle [*Epilachna corrupta*, Muls.] was first recorded in New Jersey in 1928, when entire crops of beans were destroyed in some parts of Cape May County, many growers report that considerable damage had already occurred during the previous year. The beetle is now distributed throughout all parts of the State. Since beans are treated with arsenicals at such a state of growth that a certain amount of arsenical residue would remain on the pods at harvest, a number of experiments were conducted with sprays containing extracts of pyrethrum. The sprays were effective against all the stages except the eggs, and their toxicity was increased by the addition of soap at the rate of 2 lb. to 50 U.S. gals. of spray. When flour was added at the rate of 1 lb. to 50 U.S. gals., the spray not only killed by contact but gave indication of a stomach poison effect. No injury to the bean plants was caused by magnesium arsenate as a spray or dust. Slight to heavy injury was observed where dusting or spraying with calcium arsenate had been carried out, and lead arsenate caused severe scorching wherever it was used.

BURDETTE (R. C.). **Pepper Maggot.**—*Rep. New Jersey Agric. Expt. Sta. 1928–29*, pp. 184–187. New Brunswick, N.J., 1930.

Experiments both in the field and the laboratory against the pepper maggot [*Spilographa electa*, Say] on pepper plants [*Capsicum*] show that spraying the plants with lead arsenate with or without molasses gave no appreciable control against the adults [*cf. R.A.E.*, A, xvii,

669]. In the insectary, all the flies confined with plants that had been sprayed with 1 lb. calcium arsenate to 50 U.S. gals. water, sweetened with molasses, were killed in 3 days. Sprays containing up to 3 lb. calcium arsenate can be used with safety on the plants. The use of arsenicals for controlling the flies appears, however, to be very limited. When two sprays were applied, it was necessary to wash the harvested fruit owing to arsenical residue. No effective repellents were found in field tests. The community practice of destroying the infested fruit at harvest time appears to be the only measure likely to bring the pest under control. In localities where the fruit is commonly picked and marketed when it is green, the numbers of the flies and the injury caused are limited.

Hamilton (C. C.). *Aserica castanea* **Arrow, a recently recorded Scarabaeid Beetle injurious in New Jersey.**—*Rep. New Jersey Agric. Expt. Sta. 1928–29*, pp. 203–207. New Brunswick, N.J., 1930.

Much of this information on the bionomics and control of *Aserica castanea*, Arrow, has been noticed from other sources [*R.A.E.*, A, xviii, 272, 413, 491]. All stages of the beetle are described, and a list is given of some of the food-plants of the adults, which include peaches, blackberries, pepper (*Capsicum*), carrots and a number of ornamental plants. Tests against the adults on lawns show that lead arsenate applied at the rate of 6 lb. to 50 U.S. gals. water killed all the beetles.

Houser (J. S.). **Raspberries and Blackberries in Ohio. Part III. Insect Pests of Brambles.**—*Bull. Ohio Agric. Expt. Sta.*, no. 454, pp. 67–77, 7 figs., 4 refs. Wooster, Ohio, June 1930.

Brief notes are given on the life-history and control of the more important insect pests of brambles in Ohio, which include, in addition to the species recorded in Kansas and Missouri [*R.A.E.*, A, xix, 90], *Aphis rubicola*, Oestl. (*rubiphila*, Patch) and *Amphorophora rubi*, Kalt. (the relation of these Aphids to virus diseases of raspberries is discussed in an earlier part of this bulletin by C. W. Bennett), *Phorbia rubivora*, Coq., which mines in the canes of raspberry, and *Metallus rubi*, Forbes, which is usually a pest of blackberry and dewberry, but occasionally occurs in numbers on the lower leaves of some varieties of raspberry. The Tettigoniid, *Orchelimum vulgare*, Harris, which occurs in Ohio, has caused much damage to raspberry in Illinois, weakening the canes by its oviposition punctures.

Edwards (W. H.). **Insect Pests of Sweet Potato and of Cassava in Jamaica.**—*Ent. Bull. Dept. Agric. Jamaica*, no. 5, 12 pp., 1 pl. Kingston, 1930.

Brief popular notes are given on the bionomics and control of the pests dealt with. Those attacking sweet potato (*Ipomoea batatas*) are *Corecoris fuscus*, Thnb., *Cylas formicarius*, F., *Euscepes batatae*, Waterh., *Cerotoma denticornis*, F., *Chirida signifera*, Hbst., *Coptocycla judaica*, F., *Metriona flavolineata*, Latr., *Epitrix parvula*, F., *Herse cingulata*, F., and army worms, as well as occasional minor pests,

namely *Pilocrocis tripunctata*, F., *Euscepes porcellus*, Boh., *Palaeopus costicollis*, Mshl., *Dinurothrips hookeri*, Hood, *Frankliniella* (*Euthrips*) *insularis*, Frankl., and *Tetranychus telarius*, L. Cassava (*Manihot utilissima*), which suffers little from insect attack in Jamaica when cultivated in good soils under normal climatic conditions, but sustains considerable injury in poor or dry soil or when the season is unfavourable to growth, is attacked by *T. telarius* and *C. formicarius*, as well as by *Erinnyis ello*, L., and occasionally *Ceroplastes cirripediformis*, Comst., *C. sinensis*, Del G., and *Lepidosaphes alba*, Ckll.

TUCKER (R. W. E.). **Report of the Entomologist.**—*Rep. Dept. Sci. Agric. Barbados 1929–30*, pp. 109–114. [Bridgetown] 1930.

An outline is given of the work done in Barbados in 1929–30 in connection with mass liberations of *Trichogramma minutum*, Riley, for the control of *Diatraea saccharalis*, F., on sugar-cane [*R.A.E.*, A, xix, 105]. Although several fields of young cane have been practically destroyed by *Diaprepes abbreviatus*, L., injury in general was noticeably less than in the preceding year [xviii, 468].

The measures adopted against *Platyedra* (*Pectinophora*) *gossypiella*, Saund., on cotton [xviii, 469], have apparently brought about its complete disappearance during 1929–30. An experimental plot sown during the latter part of the close season, but destroyed before it reached maturity, was fairly heavily infested, showing that the bollworm was present practically till the time of planting in 1929. The natural causes that may have contributed to its apparent disappearance are unknown, but it is possible that mass liberations of *T. minutum*, which is known to parasitise the eggs of *P. gossypiella*, may have been partly responsible. Other serious pests of cotton are *Alabama argillacea*, Hb., *Feltia* sp. and *Xylomyges* sp. The two latter usually attack sweet potato, but were found in large numbers defoliating cotton. The remedy at present advised is dusting with Paris green and lime.

Observations of *Euscepes batatae*, Waterh., which is the most serious handicap to the growing and storing of sweet potatoes, showed that tubers are attacked to a depth of 9 ins. in the soil, the intensity of the attack increasing towards the surface. Tunnels containing larvae or pupae were found running a considerable distance up the main stem, but did not extend to new young growth. Attacks on young, leaf-bearing stems were apparently due to larvae hatching from eggs presumably laid on stems or foliage. As larvae were often found at joints in stems where shoots used for propagating purposes branched off, infestation may be spread by such cuttings. The adult beetle is sluggish and not likely to spread far by flight, but is likely to cling to the clothing of workers in infested fields and so be distributed. As *E. batatae* is long-lived, infested fields should not be replanted with sweet potatoes for several seasons, and cuttings for propagation should never be taken from an infested source, or should be carefully examined before planting.

Maize is attacked by *Laphygma frugiperda*, S. & A., and *D. saccharalis*, infestation of sugar-cane by the latter being increased by the prevalent system of allowing harvested maize to remain and dry out among cane fields.

TRÄGÅRDH (I.). **Studies on the Galleries of the Bark-beetles.**—*Bull. Ent. Res.*, xxi, pt. 4, pp. 469–480, 7 figs. London, December 1930.

After discussing the galleries of various species of Scolytids, the author makes the following tentative statements regarding the activities of the beetles. The necessity for keeping the nuptial chamber and the egg-galleries clean appears to be responsible for some structural features of bark-beetles as well as for some modifications of their burrowing instincts. Whether the cleaning serves only to make repeated sexual intercourse possible or whether it is also essential for the ventilation of the eggs, including the maintenance of proper temperature and humidity, or for preventing the growth of mould, is not known. The shape and pattern of the galleries are closely related to the shape of the beetles. In the most highly specialised forms, *Ips*, *Orthotomicus* and *Pityogenes*, the elytra are more or less excavated for the purpose of acting as shovels, and it is almost exclusively in these forms that the galleries run downwards, a feature that depends on ability to transport detritus upwards. It is possible that the ventral declivity in other species serves the same purpose. In some genera the body is covered with perpendicular hairs and the base of the elytra projects forwards and forms a collar-like ridge ; both structures probably aid in cleaning the galleries. The galleries also show distinct modifications depending on whether they are excavated in standing or felled trees. The modifications in the shape of the nuptial chamber show that it also serves as a receptacle for the detritus until this is finally transported outside the bark. The entrance gallery always points downwards to facilitate the removal of the wood dust. Some species, such as *Cryphalus abietis*, Ratz., and *Pityophthorus micrographus*, L., never breed in felled trees, owing to the fact that their structure and the shape of their nuptial or egg chambers prevent their removing detritus without the aid of gravity. The direction of the larval tunnels is correlated with the depth to which they are excavated in the surface of the wood ; deep tunnels usually run longitudinally and superficial tunnels transversely or obliquely, or, if they are bored exclusively in the bark, in any direction. The necessity for utilising to the utmost the food available in a limited area and for obviating the danger to the larvae of their tunnels crossing one another, are, in the author's opinion, the two fundamental features to which the gallery-system of bark-beetles owes its origin. When the food of the larva is derived largely from the wood, the larval tunnels are usually longitudinal and arise from egg-pockets deeply excavated in the surface of the wood in more or less transverse, deeply engraved egg-galleries.

WILKINSON (D. S.). **New Species and Host Records of Braconidae.**—*Bull. Ent. Res.*, xxi, pt. 4, pp. 481–487, 1 pl., 2 figs. London, December 1930.

The Braconid genus *Rhyssosigalphus* is considered to be a synonym of *Urosigalphus*. The species dealt with include : *U. chalcodermi*, sp. n., parasitising the Curculionid, *Chalcodermus bondari*, Mshl., in Brazil ; *Phanerotoma hendecasiella*, Cam., bred from open, green cotton bolls (probably parasitic on *Earias*) in Egypt ; *Apanteles*

guyanensis, Cam., from a caterpillar, probably *Utetheisa pulchella*, L., in Western Australia ; *A. australiensis*, Ashm., from the Saturniid, *Antheraea eucalypti*, Scott, in Victoria ; *Fornicia thoseae*, sp. n., from *Thosea porthetes*, Tams [see next paper] in Celebes ; and *Cardiochiles adina*, sp. n., from a larva defoliating *Adina cordifolia* in the United Provinces, India.

TAMS (W. H. T.). **Four Moths of the Family Limacodidae injurious to Coconut Palms.**—*Bull. Ent. Res.*, xxi, pt. 4, pp. 489–490, 1 pl. London, December 1930.

The larvae of the Limacodid, *Orthocraspeda catenatus*, Snellen, are recorded as causing extensive damage to coconut palms on one estate in Celebes, in spite of a mortality of about 80 per cent., which is possibly due to a bacterial disease. The loss is increased by the fungus, *Pestalozzia palmarum* (grey blight), which attacks the leaves where they are damaged by the caterpillars. The larva, which is very briefly described, is parasitised by *Chrysis* sp., and a Tachinid, *Chaetexorista* sp. (near *C. javana*, Br. & Berg.).

Three new species are described from coconut, *viz.*, *Altha alastor*, and *Thosea porthetes*, occurring in Celebes, and *T. chrysoparala* in the Gold Coast. The first two cause little damage, *T. porthetes* being always heavily parasitised by the Braconiid, *Fornicia thoseae*, Wlkn.

MEHTA (D. R.). **Observations on the Influence of Temperature and Humidity on the Bionomics of** *Dysdercus cingulatus*, **Fabr.**—*Bull. Ent. Res.*, xxi, pt. 4, pp. 547–562, 2 figs., 37 refs. London, December 1930.

During 1927–29 investigations were carried out in the Punjab to determine the correlation between a poor cotton crop and a reduction in the numbers of *Dysdercus cingulatus*, F.

The following is largely taken from the author's conclusions : Laboratory experiments and observations in the field indicate that temperature and humidity are the two main factors that control the abundance of *D. cingulatus*. The younger nymphs and adults are almost absent in the field during the period May-August, a fact that is due to the influence of low humidity and high temperatures in preventing pairing and oviposition and increasing the rate of mortality of eggs, nymphs and adults. As the season advances and more favourable temperatures prevail, activity is resumed, the vital processes begin to function and a gradual increase in the numbers of the insect occurs. During the winter, metabolism is retarded, and there is thus a marked decrease in the numbers of the bug following a severe spell of cold weather. The failure of the cotton crop has been stated to be due to low humidity and high temperature, and if this is so, the plant and the pest are affected independently by the same adverse climatic conditions [*cf. R.A.E.*, A, xviii, 462].

[BONDAREV (O. [A.] V.).] **Бондарев (О. [А.] В.). Contact Insecticides and Coccidae.** [*In Ukrainian.*]—*Bull. Mleev Hort. Expt. Sta.*, no. 29, 12 pp., 1 ref. Mleev, 1930. (With a Summary in English.)

Preliminary spraying experiments were carried out in the Ukraine in 1929 against *Lecanium* (*Sphaerolecanium*) *prunastri*, Boy., and *Aspidiotus ostreaeformis*, Curt., on cherry, and *L.* (*Eulecanium*) *corni*, Bch., on hazel. The sprays were applied to small areas of the branches, such as could be kept under observation. The first tests, on 24th April before the opening of the buds, were made against the hibernating second instar larvae. The best results were obtained with an emulsion of 6 parts kerosene, 1 part soap and 10 parts water, diluted 1 : 7 and applied warm ; this killed all the larvae of both species of *Lecanium*, and 95 per cent. of those of *A. ostreaeformis*. Next in effectiveness was a 20 per cent. tar distillate, which killed all the larvae of *L. prunastri*, 99 per cent. of *L. corni*, and 97 per cent. of *A. ostreaeformis*. In further experiments, on 26th June, against the first instar larvae of *L. prunastri* and *A. ostreaeformis* on cherries, the kerosene emulsion, which was diluted 1 : 10, caused slight injury to the leaves. Examination on 6th August showed that all the larvae of both species had been destroyed on branches sprayed with emulsions of soap alone (4 per cent.) or kerosene, both of which were applied warm. These sprays also killed nearly all the females of *L. prunastri*, and the soap emulsion nearly all those of *A. ostreaeformis*.

PAPERS NOTICED BY TITLE ONLY.

MORLEY (C.). **Catalogus Oxyurarum brittanicorum** [Proctotrupoidea]. —*Trans. Suffolk Nat. Soc.*, i, pt. 1, pp. 39–60. [Monks' Soham, Suffolk, 21st December 1929.]

PICARD (F.). **Les insectes du chou.** [A popular account including brief notes on parasites.]—*Prog. agric. vitic.*, xciv, no. 46, pp. 473–479, 1 pl. Montpellier, 16th November 1930.

BRAUN (K.). **Bericht über das Auftreten von Schädlingen und Krankheiten im Obst- und Gemüsebau usw. im Regierungsbezirk Stade während der Monate Januar bis Juni 1929.** [Report on Pests and Diseases in Orchards and Market Gardens in the District of Stade from January to June 1929.]—*Altländer Ztg.*, nos. 139, 143, 147, 151, 155, reprint 5 pp. Jork, September–October 1930. [*Cf. R.A.E.*, A, xvii, 483 ; xviii, 662.]

WAGNER (A. C. W.). **Die Hautflüger der Niederelbe. 4. Beitrag. 14. Familie : Gallwespen (Cynipiden).** [The Hymenoptera of the Lower Elbe. 4th Contribution. 14th Family : Cynipids.]—*Verh. Ver. naturw. Heimatforsch. Hamburg*, xxi (1929), reprint 12 pp. Hamburg, 1930.

OBRAZTSOV (N. S.). **Nachtrag zum Artikel : Beitrag zur Biologie von** *Loxostege sticticalis* **L.** [Supplement to the Article "A Contribution to the Biology of *L. sticticalis*" (*R.A.E.*, A, xviii, 440).]—*Z. wiss. InsektBiol.*, xxv, no. 6–7, pp. 129–130. Berlin, 31st October 1930.

ELLINGER (T.) & CHORINE (V.). **Note on the Bacteria isolated from** *Ephestia kühniella* **Zell.**—*Internat. Corn Borer Invest. Sci. Rep.*, iii, pp. 37–38, 7 refs. Chicago, Ill., 1930. [See *R.A.E.*, A, xviii, 293.]

Ripley (L. B.) & Hepburn (G. A.). **Top-dressing against Maize Stalkborer** [*Busseola fusca*, Fuller].—*Fmg. S. Afr.*, 1930, reprint no. 80, 2 pp. Pretoria, October 1930. [*Cf. R.A.E.*, A, xix, 56.]

Gunn (D.). **The Fig and Willow Borer** [*Phryneta spinator*, F.].—*Fmg. S. Afr.*, 1930, reprint no. 79, 2 pp. Pretoria, October 1930. [*Cf. R.A.E.*, A, viii, 69.]

Michel (E.). **La soie des vers à soie sauvages du Congo** (*Anaphe*).—*Bull. agric. Congo belge*, xxi, no. 2, pp. 467–470. Brussels, June 1930. [*Cf. R.A.E.*, A, xvii, 267.]

Miller (N. C. E.) & Pagden (H. T.). **Preliminary Observations on** *Sogata* **spp. Pests of Padi** [*S. furcifera*, Horv., on rice in Malaya].—[*Bull.*] *Dept. Agric. S.S. & F.M.S.*, Sci. Ser. no. 3, pp. 10–14, 1 ref. Kuala Lumpur, 1930. [*Cf. R.A.E.*, A, xviii, 557.]

Morison (G. D.). **New Thysanoptera from South Australia.**—*Bull. Ent. Res.*, xxi, pt. 4, pp. 449–454, 3 figs. London, December 1930.

Misra (A. B.). **On the Post-embryonic Development of the Female Lac Insect,** *Laccifer lacca*, **Kerr (Hem. Coccidae).**—*Bull. Ent. Res.*, xxi, pt. 4, pp. 455–467, 1 pl., 8 figs., 3 refs. London, December 1930.

Hoffmeyer (E. B.). **Notes on some North American Callimomidae** [Torymidae] **(Hym. Chalc.).**—*Ent. Meddel.*, xvii, no. 3, pp. 213–218, 3 figs. Copenhagen, November 1930.

Bueker (E. D.). **Two new Mealy-bugs (Coccidae) in Nests of Ants** (*Lasius*).—*Amer. Mus. Nov.*, no. 453, 3 pp., 8 figs. New York, N.Y., 30th January 1931.

Hinds (W. E.) & Spencer (H.). **Borer** [*Diatraea saccharalis*] **Control** [in Louisiana] **by the Egg Parasite,** *Trichogramma minutum*.—*Sugar Bull.*, viii, no. 7, pp. 6–8. New Orleans, La., 1st January 1930. [*Cf. R.A.E.*, A, xviii, 393.]

Spuler (A.) & Webster (R. L.). **Codling Moth** [*Cydia pomonella*, L.] **Control.**—*Proc. Washington St. Hort. Ass.*, xxiv (1928), pp. 86–90. Olympia, Wash. [1929]. [*Cf. R.A.E.*, A, xviii, 273.]

Spuler (A.) & Dean (F. P.). **Recent Developments in Combination Sprays for Codling Moth** [*Cydia pomonella*, L.] **Control.**—*Proc. Washington St. Hort. Ass.*, xxv (1929), pp. 57–69, 8 diag. Olympia, Wash. [1930]. [*Cf. R.A.E.*, A, xviii, 387.]

Monte (O.). **As especies de cupins mais communs no Brasil.** [Notes on the commoner Brazilian Termites.]—*Chacaras e Quintaes*, xliii, no. 1, pp. 69–70, 1 fig. San Paulo, 15th January 1931.

Staig (R. A.). **The Fabrician Types of Insects in the Hunterian Collection at Glasgow University. Coleoptera. Part I.**—Demy 8vo, xv+110 pp., 28 pls. Cambridge Univ. Press, 1931. Price 25*s*.

Shull (A. F.). **Order of embryonic Determination of the differential Features of gamic and parthenogenetic Aphids.**—*Z. indukt. Abstam. Vererbungslehre*, lvii, no. 1, pp. 92–111, 1 fig., 4 refs. Leipzig, 1930.

Gersdorff (W. A.). **Supplement to Chloropicrin Bibliography** [80 titles].—19 pp., mimeograph. Washington, D.C., U.S. Dept. Agric., Bur. Chemistry, October 1930. [*Cf. R.A.E.*, A, xiv, 628; xvi, 368.]

Ginsburg (J. M.). **Effect of Pyrethrum Vapors on Insects.**—*Rep. New Jersey Agric. Expt. Sta. 1928–29*, pp. 176–178, 1 pl., 3 refs. New Brunswick, N.J., 1930. [*Cf. R.A.E.*, A, xviii, 553.]

BUCHNER (P.). **Tier und Pflanze in Symbiose.** [Animals and Plants in Symbiosis.]—8vo, xx+900 pp., 336 figs., 47 pp. refs. Berlin, Gebr. Borntraeger, 2nd edn., 1930. Price, paper, *M*.96.

Some 400 pages of this work are devoted to a summary of the fungi and bacteria associated with plant-feeding insects.

THORPE (W. H.). **The natural Control of** *Hyponomeuta padellus*, **L.**—*Proc. Ent. Soc. London*, v, pt. 2, p. 28, 1 ref. London, 31st December 1930.

Hyponomeuta padellus, L., of which *H. malinellus*, Zell., is considered to be the apple race [*R.A.E.*, A, xviii, 692], is liable in certain years to increase enormously in numbers, thereby causing serious trouble to fruit-growers. In England the worst epidemics of the form on apple seem to have occurred in the Midlands, that on hawthorn [*Crataegus oxyacantha*] being common in Kent and Sussex. A heavy infestation was observed in May 1929 on an isolated area of blackthorn (*Prunus spinosa*), while only normal numbers were present on hawthorn and blackthorn a few miles away. It was then found that larvae from mildly infested bushes were parasitised to the extent of over 45 per cent. by 9 species of Hymenoptera, a list of which is given, whereas parasitism of the larvae from the severe infestation was far below 1 per cent., only one species, the polyembryonic Encyrtid, *Ageniaspis fuscicollis*, Dalm., being concerned. The comparative absence of parasites may be accounted for either by the introduction there of the moths without their parasites, or by the lack of alternative hosts necessary for the development of some of the species. It is also possible that the exposed situation of the bushes was unfavourable to the parasites.

SPEYER (E. R.). **Biological Control of the Greenhouse White-fly.**—*Nature*, cxxvi, no. 3191, pp. 1009–1010. London, 27th December 1930.

A brief account is given of the distribution of the Chalcid, *Encarsia formosa*, Gah., for the control of the greenhouse whitefly [*Trialeurodes vaporariorum*, Westw.] in the British Isles [*cf.* *R.A.E.*, A, xviii, 599, 600, etc.]. A total of about 1,500,000 parasites was distributed during 1930.

MASSEE (A. M.). **The Tarsonemid Mite of Strawberry.**—*J. Pomol. Hort. Sci.*, viii, no. 4, pp. 305–308, 1 pl., 2 refs. London, December 1930.

In continuation of previous observations on *Tarsonemus fragariae*, Zimm., which has been found on strawberry in widely separated districts in England [*cf.* *R.A.E.*, A, xviii, 521], a preliminary greenhouse experiment was undertaken to determine the nature of the damage caused. The mites feed and breed in the unfolded leaves, migrating to the runners as soon as they are produced. The leaves become crinkled and brittle and the runners are malformed, resulting in the production of unhealthy plants. Under greenhouse conditions breeding was very rapid, though no males were observed.

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Walton (C. L.). **The Raspberry and Loganberry Beetle and its Control. Further Experiments with a Pyrethrum Emulsion Spray and a Dust.**—*J. Pomol. Hort. Sci.*, viii, no. 4, pp. 309–315, 1 diag., 4 refs. London, December 1930.

A further series of field trials was carried out in 1930 with pyrethrum against *Byturus tomentosus*, F., on raspberry and loganberry [*cf.* *R.A.E.*, A, xviii, 498]. In addition to the spray used in previous trials [*loc. cit.*], one made from a concentrated extract prepared in such a way that it emulsified when mixed with water, so that the need for adding caustic alkali in the field was avoided, and a 10 per cent. dust of the active principles of pyrethrum flowers incorporated with a carrier was employed. The sprays were applied to the loganberries on 5th, 12th and 19th–20th June, when approximately one-third, two-thirds and all of the flowers respectively were fully open. The results were excellent, average infestations of 35·8 and 9·6 per cent. being reduced to 7·4 and 1·0 per cent. respectively, during almost the entire cropping period. The infestation was more severe when the loganberries were near apple. The dust was more effective on raspberries (on which the sprays were not tested) than on loganberries, though all the results were inferior to those obtained by the spray.

Uvarov (B. P.). **Un Membracid américain dans les Alpes-Maritimes.**—*Bull. Soc. ent. Fr.*, 1930, no. 15, p. 242.

Maneval (H.). **A propos de *Ceresa bubalus*, F. (Hem. Membracidae).**—*Op. cit.*, no. 17, p. 276. Paris, 1930.

These papers record the occurrence of the Membracid, *Ceresa bubalus*, F., in various parts of the south of France, thus confirming the view that it is distributed throughout the French Mediterranean zone.

Balachowsky (A.). **Deux *Chionaspis* (Hem. Coccidae) nouveaux de l'*Abies pinsapo* et du cèdre.**—*Bull. Soc. ent. Fr.*, 1930, no. 17, pp. 266–273, 9 figs., 5 refs. Paris, 1930.

Chionaspis barbeyi, sp. n., is described from needles of *Abies pinsapo* in Andalucia, and *C. kabyliensis*, sp. n., from needles of *Cedrus libanotica* on the high plateau of Djurdjura, Algeria. A key to the species of *Chionaspis* (*sens. lat.*) occurring on conifers is given.

Gaumont (L.). **Deux *Pemphigella* nouveaux d'Afrique du Nord. (Hem. Aphididae.)**—*Bull. Soc. ent. Fr.*, 1930, no. 18, pp. 278–283, 4 figs. Paris, 1930.

Pemphigella mimeuri, sp. n., was observed in Morocco causing galls on the leaflets of *Pistacia terebinthus*. *P. paglianoi*, sp. n., was taken in Tunisia on the roots of barley, which was severely damaged.

Guyot (R.). **De l'influence des insectes xylophages dans la propagation de l'armillaire.**—*C. R. Ass. franç.*, lii, pp. 391–393, 3 refs. Paris, 1928. [Recd. 1930.]

Various kinds of insects occur under the bark of trees attacked by *Armillaria*, and are all capable of transporting the fungus mechanically.

An instance is recorded in which Scolytids had apparently carried it into their galleries in elms. Termites have been observed together with the fungus in pines and sometimes carried the mycelium in their mandibles.

KAUFMANN (O.). **Massenauftreten und Parasitierung der Rübenfliegenpuppen im Winter 1929–30. (Versuch einer Prognose für die kommende Vegetationsperiode.)** [The Mass Occurrence and Parasitism of Beet-fly Pupae in the Winter of 1929–30. (An Attempt at a Forecast for the Year 1930.)]—*Zuckerrübenbau*, 1930, pp. 1–7. (Abstract in *Zbl. Bakt.* (2), lxxxii, no. 1–7, pp. 157–158. Jena, 20th November 1930.)

Parasitism of pupae [of *Pegomyia hyoscyami*, Panz.] obtained from sugar-beet factories [*R.A.E.*, A, xvii, 600] varied in different parts of Germany from 50 to 99·5 per cent. The Ichneumonid, *Phygadeuon pegomyiae*, Hbmhl., was the most important, *Opius* spp. being also present. Theoretically, 95 per cent. parasitism, independent of the number of pupae, is needed to ensure a decrease of infestation. A forecast of infestation is made on this basis and on climatic data.

HÜNIKEN (E.). *Telenomus phalaenarum* **Nees aus Eiern des Kiefernspanners** (*Bupalus piniarius*). [*T. phalaenarum* from Eggs of *B. piniarius*.]—*Z. Parasitenk.*, iii, no. 1, pp. 52–55, 7 figs., 3 refs. Berlin, 17th December 1930.

Telenomus phalaenarum, Nees, was obtained from eggs of *Bupalus piniarius*, L., on pine in Pomerania, about 10 per cent. of those examined being parasitised.

GROSMANN (H.). **Beiträge zur Kenntnis der Lebensgemeinschaft zwischen Borkenkäfern und Pilzen.** [Contributions to the Knowledge of Symbiosis of Bark-beetles and Fungi.]—*Z. Parasitenk.*, iii, no. 1, pp. 56–102, 19 figs., 61 refs. Berlin, 17th December 1930.

Investigations carried out in Switzerland, chiefly with *Ips typographus*, L., on the symbiosis of bark-beetles and fungi showed that the beetles play a prominent part in the distribution of blue stain and related fungi. A species of *Ips* transports such fungi as have similar conditions of life to its own. The same fungi are, therefore, generally found with the same species of beetle. In the digestive tract of the larvae are chiefly found organisms similar to the yeasts of some Cerambycids. These are transported by the female, being introduced into the young larvae as they bore into the wood. They do not appear to be essential to the development of *I. typographus* and are apparently commensals.

MORGENTHALER (O.). **An Acarine Disease experimental Apiary in the Bernese Lake-District and some of the Results obtained there.**—*Bee Wld.*, xii, no. 1, pp. 8–10. Camberley, Surrey, January 1931.

A research apiary for the study of acarine disease of bees was established in the Berne Lake-District in 1930. The results of various

experiments are briefly reported. It was found that there is a surprisingly regular decrease in susceptibility to the disease with the increase in age of the bee ; no bees of 12 days old became infested and those 5 and 9 days old only showed an infestation of 2 and 3 per cent., the intensity being very low (only one female of *Acarapis* [*woodi*, Rennie] and a few eggs in each infested bee). It is thought that under natural conditions the infestation of bees more than 5 days old need not be taken into consideration, and that the infestation is not spread by healthy and diseased bees meeting on flowers, nor by robbers entering a diseased colony, for foragers and robbers are more than 12 days old and are thus no longer susceptible. On the other hand, robbers and foragers can harbour mites in their tracheae if they were infested when young, and the tracheal opening in old bees probably allows mites to emerge, though not to enter. Thus a robber can probably carry the disease to a healthy colony if young bees are encountered. Treatment has been found to give the best results when applied in the autumn ; this may be explained by the fact that there are then no young bees to receive the migrating mites. No mites were found in bees taken in the process of emerging, from a colony that was 90 per cent. infested, nor in young bees kept with a comb taken from the same colony, with unsealed and sealed brood. Healthy young bees placed with infested bees were infested, but healthy bees placed in wire gauze cages (with meshes of 1 mm. and 2 mm.) among the infested bees, were not, although they were fed through the wire by the infested bees. The mites were therefore not able to leave the bees and pass through the wire. It is concluded that infestation can only occur when a living infested bee comes into the closest contact, thorax to thorax, with a young bee, at most a few days old. Hives, combs, frames, honey, pollen and brood do not convey the mites.

In a free-flying colony, susceptible bees were frequently found to harbour numerous female mites in their tracheae after 24 hours (males were not found to migrate in this way). Eggs were not laid until the 3rd or 4th day after the entrance of the mite, one female depositing an average of 5–7. After a further 3–4 days larvae were observed ; the first fully developed males were found on the 11th day after infestation and the first mature females on the 14th day.

HASE (A.). **Versuche und Untersuchungen zur Epidemiologie des Maiszünslers** (*Pyrausta nub.* **Hbn.) in den Jahren 1927 und 1928.** [Experiments and Investigations on the Epidemiology of the Maize Borer, *P. nubilalis* in 1927 and 1928.]—*Z. angew. Ent.*, xvii, no. 1, pp. 1–52, 10 figs., 6 refs. Berlin, November 1930.

Field and laboratory experiments in Berlin with *Pyrausta nubilalis*, Hb., from South Germany, Rumania and Spain, are described. Many of the results have already been noticed from a briefer account [*R.A.E.*, A, xviii, 145]. Though larvae exposed out of doors to $-10°$ C. [14° F.] became frozen and brittle, individuals that were carefully thawed produced fertile adults.

The view that mugwort [*Artemisia vulgaris*] is a particularly favourable food-plant for the development of *P. nubilalis* [xvii, 211] was not confirmed by an experiment in which 25 plants were infested with 150 larvae, as none was recovered after 65 days.

Fulmek (L.). **Die grüne Schilcherwanze (*Lygus spinolae* Mey.) in Steiermark.** [*L. spinolae*, the green Bug of the Schilcher Vine.] —*Z. angew. Ent.*, xvii, no. 1, pp. 53–105, 42 figs., 36 refs. Berlin, November 1930.

Fulmek (L.). **Milbenkräusel und Wanzenkräusel im steierischen Schilcherweinbaugebiet.** [Crinkle due to Mites and Bugs in the Styrian Region of the Schilcher Vine.]—*Das Weinland*, 1930, no. 7, p. 251 (reprint 4 pp.), 3 figs. [?Vienna], July 1930.

Leaf-crinkle, entailing crop-losses of sometimes over 50 per cent., is common on this variety of grape-vine, to which over 2,500 acres are devoted in Styria. It is caused by *Lygus spinolae*, Mey., all stages of which are described, and is thought to be due to the effect of its feeding and not to a virus transmitted by it. An account of the bionomics of this Capsid is given, with a list of its food-plants. It hibernates in the egg-stage in loose bark on old vine-stocks and in cracks in the stakes. Males predominate at the beginning, and females at the end of the flight-period. In one instance a Hymenopterous parasite, probably a Braconid, was obtained from the abdomen of a male. A number of experiments were made with various insecticides, almost all proprietary ; dusts, applied repeatedly, proved superior to sprays against the larvae. The best method, however, seems to be the removal of loose bark and disinfection of the vine-stocks, stakes and ground-surface with 6 per cent. carbolineum.

The information on *L. spinolae* in the second paper is a shorter version of that given in the first. Reference is also made to a form of leaf-crinkle due to mites, against which lime-sulphur or other sprays containing sulphur are used.

Franssen (C. J. H.). **Die Biologie und Systematik der europäischen „Schwarzen Blattläuse" unter besonderer Berücksichtigung der „Niederländischen Arten."** [The Biology and Classification of the European " black Aphids " with special Regard to Dutch Species.]—*Z. angew. Ent.*, xvii, no. 1, pp. 106–145, 22 refs. Berlin, November 1930.

This is a revision of papers already noticed [*R.A.E.*, A, xvi, 541 ; xvii, 61] and includes a list of the food-plants of the various species.

Jancke (O.). **Ueber eine neue *Eriosoma*-Art an Birnenwurzeln. (Vorläufige Mitteilung.)** [On a new Species of *Eriosoma* on Roots of Pear. Preliminary Communication.]—*Z. angew. Ent.*, xvii, no. 1, pp. 146–155, 10 figs., 2 refs. Berlin, November 1930.

In October 1928, small colonies of a small, light yellow Aphid were found in the roots, especially the finer ones, of a pear tree at Naumburg, Germany. It is compared with *E. inopinatum*, Alfieri [*R.A.E.*, A, ix, 174] (with which it may prove to be identical), *E. lanigerum*, Hsm., and *E. lanuginosum*, Htg., but is tentatively considered a new species for which the name *E. flavum* is proposed. The colonies begin to occur at a depth of 8–12 ins. below the surface of the ground and are most numerous at about 18 ; in the very dry summer of 1929 they were found as deep as about 39 ins. They contain few individuals, ten being the maximum observed, and in many cases the Aphids occur

singly. This tendency is due to the preference for the finest roots, on which space is restricted. No nymphs were seen in the autumn of 1928, but in 1929 they were present from mid-August until the end of October. The offspring of the resulting alates are sexed.

[Prozorov] Prosoroff (S. S.). **Der Bockkäfer** *Monochamus quadrimaculatus* **Motsch. als Schädling der Sibirischen Tanne,** *Abies sibirica* **Led.** [*M. quadrimaculatus*, a Pest of the Siberian Silver Fir, *A. sibirica*.]—*Z. angew. Ent.*, xvii, no. 1, pp. 182–184, 3 figs. Berlin, November 1930.

Some years ago *Dendrolimus sibiricus*, Tshtv., infested the forests of *Abies sibirica* in Western Siberia, killing or weakening many trees and thus providing optimum conditions for *Monochamus quadrimaculatus*, Motsch., which is becoming a serious pest. The main flight of this beetle occurs in the first half of July, but individuals are to be found from mid-June to the second half of September. The female lays about 14 eggs, singly or in pairs, in grooves cut in the bark. In 2–3 weeks the larvae hatch, and after feeding under the bark, enter the wood. They hibernate twice and pupate in May or June. The adults emerge 2–3 weeks later and feed on the bark of the thin twigs, causing the needles above the wound to turn brown and, in the following year, to fall.

Engel (E. O.). **Fliegenmaden im Schnupftabak** (*Meoneura obscurella* **Fall.**). [Fly Maggots (*M. obscurella*) in Snuff.]—*Z. angew. Ent.*, xvii, no. 1, pp. 184–188, 6 figs. Berlin, November 1930.

Larvae of the Agromyzid, *Meoneura obscurella*, Fall., have been found in Germany infesting partly prepared snuff ground from a mild tobacco. They died when placed on a strong snuff. The larva and pupa are described.

Müller (K.). **Ergebnisse von Untersuchungen über die Verbrennungsschäden an Reben nach Anwendung arsenhaltiger Mittel.** [Results of Investigations on Scorching of Vines after Treatment with arsenical Insecticides.]—*Wein u. Rebe*, xi, no. 7, pp. 1–8. (Abstract in *Z. angew. Ent.*, xvii, no. 1, pp. 188–189. Berlin, November 1930.)

Experiments show that scorching of vines is minimised if only 1½ lb. Urania green is used to 100 gals. Bordeaux mixture and the amount of lime is reduced. The calcium sulphate produced in the preparation of the mixture prevents the copper hydroxide decomposing into copper oxide and water. It was found that lime corrodes the leaf-cuticle, with the result that arsenic or other injurious components of a spray penetrate the leaf-tissue and kill the cells. Soap that contains free alkali also corrodes the leaves. Experiments showed that free arsenious acid can be so firmly absorbed by colloids that it becomes soluble only through the stomach acids of the insect. It may thus be possible to prepare an insecticide that is highly poisonous as a stomach poison but has a minimum effect on the green parts of plants.

E[scherich] (K.). **Zyklon-Durchgasung der Kirche in Kefermarkt (Oberösterreich) gegen *Anobium*-Frass.** [Fumigation with Zyklon against *Anobium* in the Church of Kefermarkt, Upper Austria.]—*Z. angew. Ent.*, xvii, no. 1, p. 193. Berlin, November 1930.

In view of the progress of an infestation by *Anobium* [*punctatum*, DeG. (*striatum*, Ol.)] of the altar of a church in Upper Austria [*R.A.E.*, A, viii, 264], fumigation with Zyklon B was carried out from 4th to 12th November 1929 with complete success. From the results it may be concluded that three days' fumigation with a concentration of 2 volumes of hydrocyanic gas per cent. is sufficient in a well-sealed building.

Bauer (O.) & Vollenbruck (O.). **Ueber den Angriff von Metallen durch Insekten.** [Injury to Metals by Insects.]—*Z. Metallk.*, xxii, no. 7, pp. 230–233, 14 figs., 7 refs. Berlin, July 1930.

Reference is made to recorded cases of injury to metals by insects. Holes in felt-covered lead water-pipes in a cellar used for storing smoked hams and sausages in Berlin led to the discovery of adults of *Dermestes lardarius*, L., and *D. peruvianus*, Lap., in the felt, and experiments proved them capable of perforating lead with ease and tin with some difficulty, but not zinc or aluminium.

Schimitschek (E.). **Die Bedeutung von Klima und Witterung für den Lebensablauf und die Entwicklung von Insekten.** [The Importance of Climate and Weather on the Life-course and Development of Insects.]—*Zbl. ges. Forstwesen*, lvi, pp. 99–113, 121–129, 1930. (Abstract in *Zbl. Bakt.* (2), lxxxii, no. 8–14, p. 313. Jena, 12th December 1930.)

This is a discussion of the effect on forest pests of climate, ranging from that over whole regions down to the microclimate in individual trees. Where felling is arranged so that trees of all ages are present, conditions are unfavourable to insects.

Menozzi (C.). **Influenza dell' umidità e del terreno nello sviluppo larvale del *Cleonus mendicus* Gyll., curculionide dannoso alla bietola da zucchero.** [The Influence of Moisture and of Soil on the larval Development of *Conorrhynchus mendicus*, Gyll., a Weevil injurious to Sugar-beet.]—*Indust. Saccarif. ital.*, xxiii, no. 10, reprint 2 pp. Genoa, October 1930.

In the course of investigations on the bionomics of *Conorrhynchus* (*Cleonus*) *mendicus*, Gyll., in Italy [*R.A.E.*, A, xviii, 561, etc.], it was observed that a sandy soil is unfavourable to the larvae, beet grown on it being almost always free from infestation, and that in such areas a few days' rain can destroy the majority of the larvae present. Fields with loose, preferably sandy, soil, and those with more moisture than others should therefore be selected for beet. If possible, an infested field should be watered once or twice in July, or, better still, flooded for at least 6–8 hours.

Malenotti (E.). **L'esca al fosfuro contro le grillotalpe alla prova in tutta Italia.** [The Zinc Phosphide Bait against Mole-crickets tested throughout Italy.]—*L'Italia agric.*, 11th November 1930, reprint 9 pp., 17 refs. Piacenza, 1930. **Come rendere serbevole la risina al fosfuro di zinco.** [How to preserve the keeping Qualities of a Bait of broken Rice and Zinc Phosphide.]—*Il Coltivatore,* 1931, no. 3, reprint 5 pp. Casale Monferrato, January 1931.

The first article records the successful application in various parts of Italy of zinc phosphide bait [*R.A.E.*, A, xviii, 45, 335] against mole-crickets [*Gryllotalpa gryllotalpa,* L.]. Ground maize may be substituted for rice. To prepare the bait for storage it should be spread on a table or metal surface in a warm, well-ventilated room for a few hours until the moisture has evaporated and the odour of garlic that it gives off has disappeared. No wetting is necessary, as the dry bait is quite as attractive as the moist one. The loss of phosphide in drying is negligible ; an increase of about 1 oz. in the formula [xviii, 45] will more than balance any loss.

de Almeida (E. S.). **Nota sôbre a *Scutigerella immaculata* New., Miriapode depredador das culturas hortícolas.** [A Note on *S. immaculata*, a Myriapod Pest of Kitchen Garden Plants.]—*Arq. Sec. Biol. Paras. Univ. Coimbra,* i, fasc. 2, pp. 95–103, 3 figs. Coimbra, 1930.

Scutigerella immaculata, Newp., has caused serious injury to maize and vegetables at Chamusca, Portugal. An account of its morphology and biology is given from the literature, with notes on its distribution, and reference is made to observations on its control with soil fumigants and by flooding [*R.A.E.*, A, xii, 578]. At Chamusca, naturally flooded areas remained free from infestation for a considerable time. The use of sodium or calcium nitrate at the rate of 220–260 lb. per acre is suggested ; stable manure favours infestation. All old stalks of maize, cabbages, etc., should be uprooted and burnt.

de Seabra (A. F.). **Apontamentos para o estudo das Cochonilhas de Portugal (Hemípteros-Homopteros).** [Notes for a Study of the Coccids of Portugal.]—*Arq. Sec. Biol. Paras. Univ. Coimbra,* i, fasc. 2, pp. 143–148, 2 figs., 1 pl. Coimbra, 1930.

A list is given of 23 Coccids recorded in Portugal, with notes on *Leucaspis pini*, Hartig, very common on pines on the coast, and *Gueriniella* (*Monophlebus*) *serratulae*, F., new to Portugal where it was observed on *Kentia.*

Polizu (S.). **The noxious Psyllidae of Bessarabia.** [*In Russian.*]—*Sel'skokhoz. Byull.*, no. 7–8, pp. 10–13. Kishinev, 1930.

Notes are given on the bionomics and control of *Psylla pyri*, L., *P. pyricola*, Först., *P. pyrisuga*, Först., *P. mali*, Schm., and *P. pruni*, Scop., which are briefly described. The first two species attack pear and have probably five generations a year, each occupying about a month. The adults hibernate in crevices and under the loose parts of the bark. Those of *P. pyri* appear about the middle of March on

branches exposed to the sun. Pairing usually begins at the time of the development of young leaves and the formation of flower buds. The eggs are laid in groups on young shoots, and later in the summer on the lower surface of the leaves, and the females die immediately after ovipositing. The egg stage lasts 6–8 days. The larvae form colonies at the base of the buds, on the peduncles of flowers and inside the unexpanded leaves, feeding on the sap. Shortly before the final moult, the nymphs migrate to the upper surface of the leaves.

In the case of the other three species the number of generations a year is not known. *P. pyrisuga* also attacks pear. The egg stage lasts two weeks, the larvae concentrate at the base of young shoots, and the transformation of the nymphs takes place on the lower surface of the leaves. *P. mali* occurs in one district only, where it attacks several varieties of apple. Pairing takes place from mid-August till about 10th September, and the eggs hatch in the spring. The larvae infest the buds and the base of the axils of the leaves, and the nymphs attack the peduncles of the flowers. *P. pruni* is comparatively scarce and unimportant in Bessarabia ; it occurs on plum, bird cherry (*Prunus padus*) and blackthorn (*P. spinosa*).

Infestation by the larvae and nymphs causes the leaves and flowers to fall and also affects the shoots and fruit, and the honey-dew they produce serves as a medium for the development of the sooty fungus, *Capnodium salicinum.* Sprays recommended for control are dormant strength lime-sulphur before the buds open, and a 4 per cent. oil emulsion during the summer. Fumigation with tobacco is very effective against all stages ; the tobacco is burnt on small heaps of hay or dry branches arranged among the infested trees, 4½ lb. being placed on each heap.

KRASUCKI (A.). **Spostrzeżenia nad cyklem rozwojowym Tarczyka mgławego** (*Cassida nebulosa* **L.**) **w okolicach Lwowa w r. 1923.** [Observations on the Cycle of Development of *Cassida nebulosa* L. in the Environs of Lwow in 1923.]—*Mém. Inst. nat. polon. Econ. rur. Pulawy*, x, no. 1, pp. 175–190, 3 pls., 3 refs. Pulawy, 1929. (With a Summary in German.) [Recd. December 1930.]

Cassida nebulosa, L., which in the district of Lwow has one generation a year, was very abundant on *Chenopodium album* in 1923, only insignificant damage being caused to beet. The overwintered adults were observed from mid-May till the end of June ; individuals in the insectary lived till the end of August. The eggs were deposited in small batches on the leaves of *Chenopodium* and hatched in about 8 days. The larvae, which develop in 3 weeks, definitely preferred *Chenopodium* to beet, and in the insectary migrated from the latter to the former. Pupation usually occurred on the lower surface of the leaves of the food-plant and sometimes on the soil, the pupal stage lasting about 8 days. The adults are described. In the field, the young beetles occurred on *Chenopodium* from 1st July till early October ; hibernation took place in the soil.

About 30 per cent. of the larvae were parasitised by the Eulophid, *Tetrastichus rhosaces*, Wlk., the life-cycle of which is completed in two weeks. The parasites emerged between 21st June and 30th July, as many as 6–13 occurring in the host larva, which is killed before pupation.

KRASUCKI (A.). **Spostrzeżenia nad szkodnikami roślin hodowanych w południowo-wschodniej Polsce w r. 1928.** [Observations on the Pests of cultivated Plants in south-eastern Poland in 1928.]—*Mém. Inst. nat. polon. Econ. rur. Pulawy*, x, no. 1, pp. 216–223, 1 pl., 1 ref. Pulawy, 1929. (With a Summary in German.) [Recd. December 1930.]

A list is given of 25 pests observed in south-eastern Poland in 1928, with notes on their distribution and seasonal occurrence. The insects included: *Pieris brassicae*, L., on cabbage and cauliflower; *Trachea* (*Hadena*) *basilinea*, F., on wheat; *Phytometra* (*Plusia*) *gamma*, L., which was very numerous in July and attacked beet, cabbage and beans, but caused little damage as nearly all the larvae were killed by the fungus, *Entomophthora plusiae*, and some were parasitised by the Encyrtid, *Litomastix truncatella*, Dalm., and an unidentified Chalcid; *Pyrausta nubilalis*, Hb., which in some localities infested 50 per cent. of the maize crop; *Plutella maculipennis*, Curt. (*cruciferarum*, Zell.) on cabbage; *Melolontha melolontha*, L., attacking beet; *Apion apricans*, Hbst., which in one locality infested white clover stored in barns; *Chlorops taeniopus*, Mg. (*pumilionis*, Bjerk.), on wheat; *Cicadula sexnotata*, Fall., on oats and rye; *Phorodon humuli*, Schr., on hops; and *Aphis rumicis*, L., which caused serious damage to beet in July, but was attacked by Coccinellids, especially *Coccinella septempunctata*, L., and Syrphids.

KRASUCKI (A.). **Spostrzeżenia nad szkodnikami roślin hodowanych w południowo-wschodniej Polsce w r. 1929.** [Observations on the Pests of cultivated Plants in south-eastern Poland in 1929.]—*Mém. Inst. nat. polon. Econ. rur. Pulawy*, x, no. 2, pp. 588–595, 3 refs. Pulawy, 1929. (With a Summary in German.) [Recd. December 1930.]

Pests not recorded in the preceding report include *Zabrus tenebrioides*, Goeze, *Clinodiplosis equestris*, Wagn., and *Oscinella* (*Oscinis*) *frit*, L., on wheat; *Polia suasa*, Schiff. (*Mamestra dissimilis*, Kn.), and *Agrotis c-nigrum*, L., on tobacco; *Sitona lineata*, L., and *S. crinita*, Hbst., on beans and peas; *Brevicoryne brassicae*, L., *Ceuthorrhynchus pleurostigma*, Mrsh., *Phorbia* (*Chortophila*) *brassicae*, Bch., and *Athalia colibri*, Christ (*spinarum*, F.), on crucifers; *Lethrus apterus*, Laxm., on vines; *Phyllopertha horticola*, L., on beet; and *Caliroa limacina*, Retz., on pears. A severe outbreak of *Loxostege* (*Phlyctaenodes*) *sticticalis*, L., occurred in two districts, the adults being on the wing at the end of May and beginning of June. The larvae attacked a great variety of plants, but were especially injurious to beet; those of the second generation appeared at the end of July, but did not cause any appreciable damage.

[GRIVANOV (K.).] **Гриванов (К.). The Swedish Fly** (*Oscinella frit* **Lin.) in Connection with Barley and other Grain Crops under semi-desert Conditions.** [*In Russian.*]—*Zh. opuitn. Agron. Yu.-Vostoka*, viii, no. 1, pp. 123–142, 1 fig., 4 graphs, 4 refs. Saratov, 1930. (With a Summary in English.)

An account is given of observations on *Oscinella frit*, L., in 1928 and 1929 in a dry steppe district in the Republic of the Volga Germans,

where it is of considerable importance as a pest of barley, summer and winter wheat and oats [*R.A.E.*, A, xv, 644]. The biological cycle of the fly for the two years is briefly reviewed. In 1929, about 54 per cent. of the primary shoots of barley and about 73 per cent. of the secondary ones were infested; in the case of summer wheat the percentages were 20·7 and 28·3 respectively. The relation between temperature, growth of the summer crops and activity of the fly is discussed. Its economic importance depends largely on the meteorological conditions in spring. In a dry spring plants injured at the time of the formation of the second leaf are killed, and injury at the time of formation of the third results in a considerable decrease in tillering and a loss of crop. In years when the moisture content of the soil is sufficient, injury to secondary shoots is of no economic importance. Winter wheat may be safeguarded by late sowing (28th August–14th September), but this is not necessary if the temperature in August is above 30° C. [86° F.], heat and drought being unfavourable to the fly. Thus in 1929, when the relative humidity in August was about 12 per cent., winter wheat sown as early as the 14th of the month was not infested.

Eritrea: Desert Locust (*Schistocerca gregaria*).—*Int. Bull. Plant Prot.*, iv, no. 11, pp. 161–162. Rome, November 1930.

At the close of the 1929 invasion in Eritrea, great numbers of *Schistocerca gregaria*, Forsk., were destroyed by *Empusa grylli*, *Isaria* sp. and *Sarcophaga* sp. An account is given of the outbreak from February to June 1930. The swarms, which came mostly from Abyssinia and the Anglo-Egyptian Sudan, were dealt with by means of flame throwers and poison baits.

CAVADAS (D. S.). **Hellenic Republic: Crop Diseases and Pests.**—*Int. Bull. Plant Prot.*, iv, no. 11, pp. 162–163. Rome, November 1930.

In the early part of 1930, cereals were severely infested in Thessaly by *Mayetiola* (*Cecidomyia*) *destructor*, Say, which attacked wheat and barley, and *Chlorops taeniopus*, Mg. Peach trees in nurseries were damaged by *Anarsia lineatella*, Zell., which was first found in 1929 at Florina, Macedonia, on young peaches imported from Italy. The yield of olives at Pelion was greatly reduced by *Prays oleellus*, F., which destroyed many of the flower buds in March and 90 per cent. of the blossoms.

CAVADAS (D. S.). **Hellenic Republic: Means for securing Success in the Control of the Olive Fly by the artificial Method.**—*Int. Bull. Plant Prot.*, iv, no. 11, pp. 164–166. Rome, November 1930.

As olives only become attractive to *Dacus oleae*, Gmel., when they have reached a certain degree of maturity and possibly also a certain size, the initial attack in any season is concentrated on trees on which the fruit ripens early owing to their variety or situation. When the fruits of the later varieties become attractive, they serve as oviposition centres for the next generation. Bait-sprays should therefore be applied to all trees that ripen early before the first eggs are laid.

Sureya [M.]. **Turkey : Desert Locust** (*Schistocerca gregaria*). **The Moroccan Locust** (*Dociostaurus maroccanus*) **in 1930.**—*Int. Bull. Plant Prot.*, iv, no. 11, pp. 166, 167. Rome, November 1930.

On 7th April 1930 *Schistocerca gregaria*, Forsk., appeared on the Turkish-Syrian border and gradually spread northward. The first hatchings were reported on 10th May.

Considerable breeding grounds of *Dociostaurus maroccanus*, Thnb., were found in the south of Turkey in 1929. Hatching of the hoppers began on 15th March 1930, and some damage was done to cereals by flights coming from the south at the end of the season.

Delassus (—). **Algeria : Pink Bollworm of Cotton.**—*Int. Bull. Plant Prot.*, v, no. 1, pp. 4–5. Rome, January 1931.

It has been found that *Platyedra* (*Gelechia*) *gossypiella*, Saund., occurs in all cotton-growing districts in Algeria, although the intensity of infestation varies in different places. Decrees of March 1930 prescribe the immediate burning after picking, or at latest before 15th January, of all plants left in the field, and the disinfection of seed, which will take place at one fumigation centre, by means of hydrocyanic acid gas. Tests were carried out with light traps (acetylene lamps over tanks of water covered by a film of oil), 23 and 75 moths being caught by 7 lamps on 17th and 18th September, and 1,834 during the following fortnight. The numbers caught were often greater at dawn than in the evening.

Kruger (G.). **Cyrenaica : Insect Pests.**—*Int. Bull. Plant Prot.*, v, no. 1, p. 5. Rome, January 1931.

Between July and September 1930 in Cyrenaica, numbers of adults of the Bostrychid, *Apate monacha*, F., were found in the trunks of *Melia azedarach* ; the infested trees were cut down and buried. The Tenebrionid, *Opatroides punctulatus*, Brullé, attacked the bark of mulberry trees ; in the nurseries excellent results were obtained by spreading a mixture of Paris green and bran (1 : 200) round the plants. Larvae and dead females of the Prionid, *Aegosoma scabricorne*, Scop., were found in the branches and trunks of apricot trees in an oasis. Winter pruning and the removal of the most severely infested trees are recommended.

Adle (A. H.). **Persia : Some Insect Pests.**—*Int. Bull. Plant Prot.*, v, no. 1, pp. 8–9. Rome, January 1931.

The distribution of *Earias insulana*, Boisd., on cotton in Persia is discussed. In one case the loss to the crop was estimated at 52 per cent. Damage to wheat by *Eurygaster integriceps*, Put., has increased since 1924, 70 per cent. of the crop being destroyed in certain villages in 1930. On the whole, locusts were less injurious in 1930 than in 1929, though the province of Azerbaijan, which had not previously suffered from them, was invaded by large swarms from Turkey. In addition to *Schistocerca gregaria*, Forsk., *Dociostaurus maroccanus*, Thnb., occurred in some parts of Persia.

BEMELMANS (J.). **Les ennemis du caféier.**—*Ann. Gembloux,* xxxvi, no. 12, pp. 418–424. Brussels, December 1930.

The principal pests and diseases of coffee are recorded in a table, indicating the countries in which they occur and the part of the plant attacked. An account is given of the bionomics and control of the Scolytid, *Stephanoderes hampei,* Ferr., as well as a brief note on the Anthribid, *Araecerus* (*Araeocerus*) *fasciculatus,* DeG., which attacks the dried beans.

VRIJDAGH (J.). **Tableau systématique des insectes nuisibles aux plantes cultivées du Congo belge.**—*Ann. Gembloux,* xxxvi, no. 12, pp. 425–434, 40 refs. Brussels, December 1930.

This table of the insects injurious to cultivated plants in the Belgian Congo has been compiled to a great extent from the notes and collections of Professor Mayné. In each case the food-plants are given, and in most instances an indication of the importance of the pest.

COTTERELL (G. S.). **The Occurrence of** *Sahlbergella* **spp. and other Pests of Cacao in Fernando Póo, San Thomé and the Belgian Congo.**—*Bull. Dept. Agric. Gold Coast,* no. 20 (*Pap. 2nd Conf. W. Afr. Agric. Offrs. Gold Coast, Oct. 1929*), pp. 162–171, 2 refs. Accra, 1930.

An account is given of a tour made in the latter half of 1928 to obtain information on the occurrence of *Sahlbergella* spp. in the islands of Fernando Po and San Thomé, and in the Belgian Congo, and to ascertain whether any parasites of these Capsids exist other than the Braconid, *Euphorus sahlbergellae,* Wlkn., the only one occurring in the Gold Coast. A description is given of the situation, conformation, soil, climate and cacao production of the countries visited.

It was found that *S. singularis,* Hagl., is a common pest of cacao in Fernando Po, where, however, owing to the better soil and more regular humidity, the recovery of the trees is more rapid than that of the average ones in the Gold Coast, the severest attack being usually found on trees growing in poorer soils. The degree of parasitism by *E. sahlbergellae* was found to be 12 per cent. in September, as compared with an average of 1–5 in the Gold Coast. The Ichneumonid hyperparasite, *Mesochorus melanothorax,* Wlkn., was not found on the Island, whereas parasitism of *Euphorus* by it in the Gold Coast is as high as 40–50 per cent.

In the course of breeding nymphs of *S. singularis,* a closely allied Capsid, *Bryocoropsis* [*cotterelli,* China], was obtained. Other pests of cacao in this Island are the Noctuid, *Characoma stictigrapta,* Hmps., which is more common than in the Gold Coast owing to greater humidity, and is almost invariably associated with *Phytophthora* ; and *Helopeltis bergevini,* Popp., which is of little importance. Scales of the genus *Stictococcus* are particularly abundant, but are probably beneficial on account of the ants that foster them and keep away pests such as *Sahlbergella* and thrips. These scales were commonly found on the leaf petioles, a situation in which they are rarely found in the Gold Coast. *Selenothrips* (*Heliothrips*) *rubrocinctus,* Giard, was not common. A small black ant, *Rhoptromyrmex* (*Acidomyrmex*) sp., is exceedingly abundant and is also common in the Belgian Congo ; it constructs small nests of dirt, excrement and regurgitated material

between two contiguous leaves. Thrips rarely if ever occur on trees infested with nests of this ant, or on adjacent ones. Two weevils, *Ischnotrachelus theobromae*, Mshl., and *Myllocerus* sp., were found to be common on the leaves of young and unshaded cacao, causing considerable defoliation. Only the adults cause damage, nothing being known of the habits of the larvae.

One of the most important pests of cacao is the Melolonthid, *Camenta obesa*, Burm., the larvae and adults of which feed on the tap root and lateral roots a few inches below the surface of the soil. Young cacao trees are often killed, whereas older ones recover owing to their more robust root system. Spraying with Bordeaux mixture is carried out three times a year against *Phytophthora*, which is the most serious pest on the Island, and Paris green is often mixed with the spray against *Characoma stictigrapta*. No remedial measures are applied for *Sahlbergella*; although a nicotine sulphate spray has been found successful, its use is too expensive to be practical.

Sahlbergella spp. have not been recorded as attacking cacao in San Thomé, although conditions are ideal for *S. singularis*, owing to frequent flushes of new growth following attack by thrips. *C. stictigrapta* was also absent, and *Helopeltis* spp. were doing little damage, *H. sanguineus*, Popp., being the commonest. Attack by borers was found to be localised, the most usual species being *Engyophlebus obesus*, Karsch (*Eulophonotus myrmeleon*, Feld.). *Mallodon downesi*, Hope, is also common but is only found attacking old or dying trees. *Selenothrips rubrocinctus* is the most serious pest on the Island, the export of cacao having dropped 50 per cent. since it was first recorded as a pest in 1916. It is equally abundant in the north of the Island, where dry conditions prevail, and in the south, where there is an excessive degree of humidity. The author believes it to be an introduced species because of the sudden commencement of the attack, the severity of infestation on alternative food-plants such as *Terminalia* sp., avocado (*Persea gratissima*) and *Artocarpus* sp., and the absence of natural enemies. An internal nymphal parasite, *Dasyscapus parvipennis*, Gahan, which effectively controls the thrips in the Gold Coast, where parasitism reaches 80 per cent. in heavy infestations, was not observed in San Thomé, and the ant, *Rhoptromyrmex*, which checks it in Fernando Po, was also absent. It is suggested that parasites should be introduced. As the result of the amount of dead wood left after attack by thrips, termites are of considerably more importance than in the Gold Coast, living tissue being frequently attacked when in proximity to dead or dying wood. The commonest species are *Calotermes* (*Neotermes*) *gestroi*, Silv., and *Rhinotermes* (*Schedorhinotermes*) *putorius*, Sjöst.

In the Belgian Congo, where the author arrived in mid-November and remained till the end of January, *Sahlbergella singularis* is common wherever cacao is grown. The distances between the few existing plantations in the equatorial district indicate that it is indigenous on the mainland, as it could hardly have spread so far in the short time that cacao has been established. In the district where cacao was first established in the Belgian Congo, a large number of plantations have been abandoned owing to it. The attack first became severe following two consecutive years of drought in 1918 and 1919. Cacao growing on alluvial soils is always more heavily infested than that on soils of a heavier nature. Manuring with superphosphate has been found successful in warding off attack. *S. theobroma*, Dist., which has only

been recorded in Sierra Leone and the Gold Coast, was not found in the Belgian Congo, but a species of *Sahlbergella* has been observed by Dr. Staineur on *Eriodendron* seedlings, which in the Gold Coast are attacked by *S. theobroma* and not by *S. singularis*. *Selenothrips rubrocinctus* is not a serious pest, but a number of insects that are purely minor pests in the Gold Coast are important in a district where a large amount of cacao is grown without shade. These include the borers, *Engyophlebus obesus*, *Tragocephala guerini*, White (*anselli*, Bates) and *T. maynei*, Gahan. A form of damage similar to that caused by *T. gorilla*, Thoms., and *T. chloris*, Chevr., in the Gold Coast is caused by adults, probably of *Tragocephala*, on the shoots. The bark is eaten in a number of longitudinal slits to form an incomplete ring around the shoot, a few inches below the growing point. An egg may then be inserted just above, the resulting larva boring downwards, though a number of shoots are girdled without an egg being laid. *Helopeltis* sp. is not so common as in the Gold Coast and causes little damage. Other pests are the Lymantriid, *Euproctis mediosquamosa*, B.-Baker, the Acridid, *Zonocerus variegatus*, L., and the Curculionids, *Systates* spp., all attacking the foliage; and the Eumolpid, *Menius parvulus*, Jac., the Pentatomid, *Atelocera serrata*, F., and *Characoma stictigrapta*, attacking the pods.

PETTEY (F. W.) & JOUBERT (C. J.). **Pear Mealy Bugs and Results of Experiments for their Control.**—*Sci. Bull. Dept. Agric. S. Afr.*, no. 95, 23 pp., 5 figs. Pretoria, 1930.

Pseudococcus gahani, Green, and *P. maritimus*, Ehrh., are the two mealybugs that attack pears in Cape Province [*cf. R.A.E.*, A, xvii, 23]. The latter, which has three generations and a partial fourth in a year, is the more important pest, and it also often causes serious injury to vines. It was probably introduced on vine stocks from the United States. All stages are present throughout the year. The eggs, which are most abundant during late summer, are laid in an ovisac, under the shelter of loose bark, in the calyx cup of the fruit, etc., the ovisac containing an average of 306. Oviposition begins a month after maturity has been reached and lasts from 1 to 4 weeks according to the temperature, the females usually dying within a fortnight of ovipositing. The incubation period varies from a week in the summer to a little over two months in the winter, and the complete life-cycle from 2½ to 5 months. Before reaching the second moult, the male spins a small cocoon in which it transforms into a winged adult. The honey-dew produced by the mealybug serves as a medium for the development of a sooty fungus, which stains the skin of the fruit, and considerably reduces its market value.

An account is given of spraying experiments conducted against *P. maritimus* from 1925 to 1930, of which the more recent ones have already been noticed [*R.A.E.*, A, xviii, 659].

ALLAN (W.). **Insect Pests and Plant Diseases of economic Importance during the Year.**—*Ann. Rep. Dept. Agric. N. Rhodesia 1929*, pp. 36–44. London, 1930.

On *Citrus*, *Aphis tavaresi*, Del G. (black citrus aphis) is frequently found throughout Northern Rhodesia; tobacco extract or nicotine sprays are recommended to control it. *Coccus hesperidum*, L., and *Chrysomphalus ficus*, Ashm. (*aonidum*, auct.) are the only scale-insects

that do serious damage; the Cetoniid, *Pachnoda impressa*, Goldf., and other Lamellicorn beetles have been reported as causing defoliation. Minor pests are *Trioza* sp. (citrus psylla); *Argyroploce leucotreta*, Meyr. (false codling moth), and *Papilio demodocus*, Esp. (*demoleus*, auct.). A test has been made of a spray containing 3 parts castor oil, 1 part each of resin and ammonia (0·880) and 50 parts of water for use on *Citrus*, but as some leaf-fall occurred on certain trees, it is not recommended for general use until further trials have been made. On coffee, *Anthores leuconotus*, Pasc. (white borer) is the most serious pest in one district, and the cricket, *Brachytrypes membranaceus*, Dru., is injurious to seedling coffee on sandy soils.

The more important cotton pests have been noticed elsewhere [*R.A.E.*, A, xviii, 298]; minor pests include the bugs, *Lygaeus rivularis*, Germ., *Oxycarenus albidipennis*, Stål, *Anoplocnemis* sp. and *Nezara* sp.; the leaf-eating Lepidoptera, *Pteronycta fasciata*, Hmps., *Cosmophila auragoides*, Guen., and *Xanthodes graellsi*, Feisth.; the grasshopper, *Zonocerus* sp.; and the Meloids, *Mylabris* sp., *M. dicincta*, Bert., and *Coryna pilosa*, Fhs., which attack the flowers.

The larva of the weevil, *Omophorus stomachosus*, Boh., eats into the heart of figs and causes them to drop. *Busseola fusca*, Fuller (maize stalk borer) is probably the most serious pest of maize, which is also attacked by *Heliothis* (*Chloridea*) *obsoleta*, F., and an insect thought to be the Tettigoniid, *Acanthoplus discoidalis*, Wlk., which sometimes does considerable damage to the young cobs. Tobacco is also attacked by *H. obsoleta* and by *Phthorimaea heliopa*, Lw., and *P. operculella*, Zell. Vegetable pests include *Bagrada hilaris*, Burm., *Plutella maculipennis*, Curt., *Athalia flacca*, Kon. (turnip sawfly) and *Brevicoryne* (*Aphis*) *brassicae*, L., on crucifers; *Epilachna chrysomelina*, F., and *Aphis gossypii*, Glov., on cucurbits, and *Phthorimaea operculella* on potatoes.

Tooke (F. G. C.). **Insects in Relation to Prickly Pear Control.**—*S. Afr. J. Nat. Hist.*, vi, no. 5, pp. 386–393. Pretoria, November 1930.

In view of the menace to agriculture in South Africa from prickly-pear (*Opuntia* spp.) and the importance of promptly tackling the problem of its eradication, the author reviews the biological means of dealing with it that have proved so successful in Australia. The principal species occurring in South Africa are *O. decumana*, *O. decumana* var. *spinosa* (the former being obtained from the latter by selective cultivation and being a very valuable fodder plant) and *O. aurantiaca*, which is the most dangerous species and is spreading rapidly. In 1913, *Dactylopius ceylonicus*, Green (*indicus*, Green) was introduced into South Africa. It confined its attack to *O. monacantha* and within a few years practically exterminated that species. About five years ago, *Cactoblastis cactorum*, Berg, which has been the outstanding success against *Opuntia* in Queensland [*R.A.E.*, A, xviii, 287], was introduced, and, although effective in destroying *O. decumana* var. *spinosa* and *O. aurantiaca*, proved equally destructive to the valuable *O. decumana*, and also showed a tendency to feed to a slight extent on economic plants other than cactus. All the colonies were therefore destroyed, and while developments in Australia are being carefully watched, landowners in South Africa are advised for the present to resort to chemical methods of destroying *Opuntia*.

KUNHIKANNAN (K.). **Control of Cactus in Mysore by means of Insects.** —*J. Mysore Agric. Exp. Un.*, xi, no. 2, pp. 95–98, 1 pl. Bangalore, 1930.

Observations on the relative merits of biological and chemical control of *Opuntia* have proved that the cost of the latter would be prohibitive over large areas, though it is more rapid in effect. The maximum spread of the Coccid [*Dactylopius opuntiae*, Ckll.] imported into Mysore for the control of *O. dillenii* [*R.A.E.*, A, xvii, 692] has been a quarter of a mile in two years. It is thought that it could be more widely distributed if spread by hand once every two months, coincidently with each successive generation. A brief account of the insect and of the method of distributing it is given. In addition to *O. dillenii* it can infest *O. nigricans*, which is less common in Mysore, but does not thrive so well on it.

BEGEMANN (H.). **Nieuwe methoden voor de ontsmetting van koffiezaad II. Ontsmetting door fumigatie met terpentijn.** [New Methods for disinfecting Coffee Seed II. Disinfection by Fumigation with Turpentine.]—*Meded. Proefst. Malang*, no. 76, 11 pp. (Reprint from *Arch. Koffiecult.*, iv, no. 2, October 1930.) Surabaya, 1930.

Further investigations in Java on the use of turpentine as a fumigant against *Stephanoderes hampei*, Ferr., for treating coffee seed intended for planting [*R.A.E.*, A, xiv, 438 ; xv, 417] showed that the quantity need not exceed 1 fl. oz. per 20 cu. ft. (50 cc. per cu. metre) provided that the chamber can be hermetically sealed and the fumes are uniformly distributed. As the first condition is usually not attainable and the second has to be ensured by placing cotton rag soaked in turpentine in layers between the seed, the quantity of turpentine is increased to 1 cc. per 100 cc. of rag, and the coffee seed is spread in layers of not more than 2¾ ins. depth on the rags. By this means even the pupae, which are more resistant than the eggs, larvae or adults, are destroyed. Fumigation must last three days, not two as previously recommended [xv, 417]. Germination is not affected unless the embryo itself is actually wetted by the turpentine, and no special precautions are needed to keep the seed from touching the rags. It appears probable that airing the fumigated seed for 2–3 hours helps to retain germination qualities ; re-infestation during this process does not occur. Both fresh seed and seed that has been stored for a month can be treated. A galvanised iron box, or drum, with a tight fitting lid is used for fumigation, the depths for the layers being marked on the inside. After fumigating and airing the seed, it should be stored in boxes or tins mixed with about 30 per cent. of its weight of dry, finely powdered wood charcoal.

MILLER (N. C. E.). **Division of Entomology. Annual Report for 1929.**—[*Bull.*] *Dept. Agric. S.S. & F.M.S.*, Gen. Ser. no. 3, pp. 50–61. Kuala Lumpur, 1930.

A summary of this report has already been noticed [*R.A.E.*, A, xviii, 593], and many of the pests dealt with have been recorded in other papers [xviii, 57, 593]. Two unusual Pentatomids on rice

were *Hotea curculionoides*, H.-S., and *Megarrhamphus hastatus*, F. (*rostratus*, F.), but it is doubtful whether they feed regularly on this plant. On *Palaquium gutta*, larvae of the Thyridid, *Rhodoneura myrtaea*, Dru., caused some defoliation, and the Cerambycid, *Pachyteria virescens*, Pasc., bored into the branches in Pehang. Pests of *Uncaria gambir* included the Membracids, *Tricentrus caliginosus*, Wlk., *Ebhul varius*, Wlk., and *Centrotypus* sp., the Pentatomid, *Anaca* sp., the Capsid, *Helopeltis sumatranus*, Roepke, the Aegeriid, *Paranthrene cyanogama*, Meyr., the Lymantriid, *Dasychira* (*Orgyia*) *mendosa*, Hb., and the Sphingid, *Deilephila hypothous*, Cram. *Anona muricata* (soursop) was infested by Cossid larvae and the Coccid, *Paralecanium expansum* var. *metallicum*, Green; the Pierid, *Delias hyparete*, L., was a minor pest of the leaves. Many of the more usual pests of other crops are recorded, as well as a number of miscellaneous insects. Observations on Lepidopterous stem-borers of rice and the rearing and liberation of *Trichogramma nanum*, Zehnt., for their control are also described [xviii, 655, 657].

MILLER (N. C. E.). **A major Pest of** *Derris*; *Neolepta biplagiata.*—*Malayan Agric. J.*, xviii, no. 11, pp. 541–544, 3 figs. Kuala Lumpur, November 1930.

The adults of the Galerucid provisionally identified as *Neolepta biplagiata*, Jacoby [*R.A.E.*, A, xix, 139] cause much damage to the young leaves and shoots of *Derris* in Malaya. All the stages are described. The eggs are deposited in the soil, and the larvae and pupae are found about 4 ins. below the surface, near the main stems of the plant and also under trailing branches. As it is probable that an alternative food-plant exists in the jungle, the danger of infestation might be lessened by planting *Derris* as far from it as possible. Satisfactory results (about 95 per cent. mortality) were obtained with sprays, one consisting of pyrethrum powder, fish oil soap, water and petroleum [*loc. cit.*], the other, which was somewhat less effective, containing naphthalene instead of petroleum. The beetles are more abundant after a fall of rain, and it may be that rain facilitates emergence.

Codling Moth Control.—3 pp. Sydney, N.S.W. Dept. Agric., 1930.

This leaflet contains practical advice on the control of the codling moth [*Cydia pomonella*, L.] based on extensive experiments [*R.A.E.*, A, xvi, 101]. Further tests are being made to determine what interval must elapse between the use of oil and lime-sulphur sprays in order to obviate damage to the trees. The advantages of orchard sanitation are pointed out, and a suitable pit for burying infested fruit is described. The regulations required to be observed by growers are outlined.

ALLMAN (S. L.). **Codling Moth Experiments, 1929–30. Summary of Results obtained at Bathurst Experiment Farm.**—*Agric. Gaz. N.S.W.*, xli, pt. 11, pp. 834–844. Sydney, 1st November 1930.

An account is given of experiments in New South Wales in 1929–30 against the codling moth [*Cydia pomonella*, L.] on apple. Formulae

are given for the 14 different treatments employed, the methods of estimating the results being the same as for the preceding year [*R.A.E.*, A, xix, 140].

The following is largely taken from the author's summary, the quantities of insecticide given being those used to 50 gallons of spray unless otherwise stated: White oil (1 : 80) with lead arsenate (20 oz.) gave a satisfactory control. A somewhat similar miscible oil injured the fruit and gave less control. White oil (1 : 80) with nicotine sulphate (1 : 800) gave fair results, being mainly ovicidal in its action, but caused a certain amount of injury to the fruit. Lead arsenate dusts (20 per cent.) were unsatisfactory as compared with lead arsenate sprays. The use of white oils alone following 3 or 4 applications of lead arsenate was not satisfactory. Control by calcium arsenate (20 oz.) was markedly inferior to that by lead arsenate at the same strength. Hellebore or pyrethrum (4 oz. powder per gallon water) proved inefficient. Muddy water should not be used where white oil combinations are employed, as it may leave an objectionable deposit. The results of experiments with bands are also given, as well as of laboratory tests of ovicides and larvicides carried out in 1927–28 [*cf.* xviii, 202].

Fumigation for Control of Scale Insects of Citrus Trees.—9 pp. Sydney, N.S.W. Dept. Agric., 1930.

This paper is based on results of experimental work during the last four years on the best methods of fumigating *Citrus* against Coccids. The best time of year for fumigation in New South Wales is from December to March, as the fruit is then small, and as it expands will throw off the dead Coccids. White wax scale [*Ceroplastes ceriferus*, And.] is generally in the early stages of development in January and February and is easily killed, though later on control is far more difficult. In the case of red scale [*Chrysomphalus aurantii*, Mask.] there is no evidence that mortality is higher from December to February than in late autumn and winter, but if fumigation is delayed until the fruit has nearly reached its full size, it will not become clean by picking time. It is, however, better to fumigate late than to leave trees infested until the following summer, though when the fruit is nearly ripe fumigation may cause it to fall. The pot method and the dust (calcium cyanide) method are described and dosage tables for each are given.

Other methods include the use of a porous mineral earth impregnated with hydrocyanic acid gas, which is kept in air-tight canisters; this when exposed to the air rapidly gives off the gas, so that it is only necessary to scatter it under the tent. Measuring is based on the gas content and not on the weight of the material, and a special device is available for this purpose. Another method is a variation of the dust one, a high grade calcium cyanide being compressed into small blocks that do not give off their gas until they are ground up and blown under the tent. Each block has a definite gas content, and a small machine, operated by hand, grinds up the blocks and blows the resulting powder under the tree in one operation. These methods are being further investigated.

CHU (J. T.). *Rondotia menciana,* **the Mulberry Tree Pest.** [*In Chinese.*]—*Misc. Pub. Bur. Ent. Chekiang Prov.*, no. 2, 4+40+4 pp., 4 pls. [Kashing] Chekiang, China, 1930. (With a Summary in English.)

These studies on the Bombycid, *Rondotia menciana,* Moore, were carried out in Chekiang during 1929–30. There are two generations a year. The adults disperse from the place where they emerge and oviposit on mulberry, the only food-plant. The females lay an average of 200 eggs each, in masses, the overwintering eggs being covered with hair-scales. Owing to the migrating habit of the moths and the fact that they select trees with dense foliage for oviposition, sudden local outbreaks of the larvae may occur, and in early autumn may be sufficiently severe to defoliate the trees. Unusually low temperatures appear to be unfavourable to the overwintering eggs, and rains and heavy fogs have an important bearing on the development of the larvae. The eggs were parasitised by *Ooencyrtus* sp. and a Mymarid, *Paranagrus* sp., and the larvae by *Brachymeria ? obscurata,* Wlk.

JEN (Ming-Tao). *Hispa armigera,* **the armour Weevil.** [*In Chinese.*] —*Misc. Pub. Bur. Ent. Chekiang Prov.*, no. 3, 12+72+2 pp., 1 pl., 4 graphs, 1 map. [Kashing] Chekiang, China, 1930. (With a Summary in English.)

Hispa armigera, Ol. [*R.A.E.*, A, xiv, 140] is one of the most destructive pests of rice in Chekiang, and also attacks sugar-cane, *Zizania aquatica* and other grasses. There are 3 or 4 generations a year in the field, but only 2 occur on *Z. aquatica.* The beetles breed from April to late August, the first generation developing in about two months and the others in 22–26 days. Upon emerging from hibernation, the adults feed on the young buds and leaves of their food-plants. The eggs are laid on the leaves a few days after emergence, the number deposited by a female varying from 22 to 226. In summer the egg stage lasts 6–10 days, the larval 10–14 and the pupal 5–6.

SONAN (J.). **A few Host-known Ichneumonidae found in Japan and Formosa.**—*Trans. Nat. Hist. Soc. Formosa,* xx, no. 110, pp. 268–273, 1 fig. Taihoku, Formosa, October 1930.

The species dealt with are *Charops arctornisae,* sp. n., reared from the Limacodid, *Natada furva,* Wilem., and the Lymantriid, *Arctornis alba,* Cram., *Pimpla formosana,* Cush., from the Psychid, *Clania minuscula,* Btlr., and *Hemipimpla rugosa,* DeG., *Echthromorpha notulatoria,* F., *Theronia zebroides,* Krieger, and *Cryptus flavicoxatus,* sp. n., from *Hyblaea puera,* Cram., all in Formosa ; and *Anilastus japonicus,* sp. n., *Pezomachus lemae,* sp. n., and *Bathythrix kuwanae,* Vier., from cocoons of the Criocerid, *Lema melanopa,* L., in Japan.

SONAN (J.). **Some new Species of Hymenoptera in Japanese-Empire, with two known Species.**—*Trans. Nat. Hist. Soc. Formosa,* xx, no. 111, pp. 355–360. Taihoku, Formosa, December 1930.

Among the species dealt with are the Ichneumonids, *Bathythrix kuwanae,* Vier., from Korea, *B. kuwanae* var. *nigrans,* n., *B. rufus,* sp. n., and *Habrocryptus ruficoxatus,* sp. n., from Japan, and *Melcha lemae,* sp. n., from Formosa, all of which were reared from cocoons of the Criocerid, *Lema melanopa,* L.

VANDENBERG (S. R.). **Report of the Entomologist.**—*Rep. Guam Agric. Expt. Sta. 1928*, pp. 23–31. Washington, D.C., 1930.

Rhabdocnemis obscura, Boisd. (sugar-cane borer), which is generally present on sugar-cane in Guam, also attacks the bud tissue of the coconut palm and has recently been found established in the bole or lower part of the trunk, all stages except the egg occurring in the semi-solid wood. The burrows were not more than 1½ ins. deep in the wood, and no borers were found above 4 ft. from the ground, above that there being apparently not enough dormant root tissue and moisture for their development. Records of the life-history of the weevil show wide variations, all stages being found at any time of year, but in sugar-cane the period from egg to egg probably ranges from 89 to 125 days. The Tachinid, *Ceromasia sphenophori*, Villen., which was first introduced from Hawaii in 1926, is very successful in holding the borer in check wherever it is liberated. Breeding and subsequent liberations in various localities are described.

Pimpla (*Exeristes*) *roborator*, F., has been introduced from Michigan for the control of the European corn borer [*Pyrausta nubilalis*, Hb.]. Its life-cycle in the insectary proved very variable ; under optimum conditions it requires only 18 or 19 days. About 1,850 individuals have been liberated in maize fields, but it is not yet known whether they have become established. *Aspidiotus destructor*, Sign. (coconut scale) was difficult to find ; wherever it occurred it was kept in check by the Coccinellid, *Cryptogonus orbiculus* var. *nigripennis*, Wse. The leaf-eating beetle recorded in the previous year as attacking mango and other plants [*R.A.E.*, A, xvii, 605] has now been identified as the Eumolpid, *Phytorus pinguis*, Baly.

DA FONSECA (J. P.). **Uma nova especie do genero** *Coccotrypes* **Ipidae Cryphalinae (Coleoptera).** [A new Species of *Coccotrypes*.]—*Arch. Inst. biol.*, iii, pp. 87–92, 2 pls., 6 refs. S. Paulo, 1930. (With a Summary in English.)

Coccotrypes circumdatus, sp. n., all stages of which are described, infests the seeds of *Cocos australis* in S. Paulo, Brazil, but confines its attack exclusively to nuts with a half-dry husk that are lying on the ground. The female bores through the husk and hard shell and oviposits within it. Fumigation of infested nuts with carbon bisulphide is advocated.

DE ANDRADE (E. N.). **Subsidios para a entomologia agricola brasileira. viii. Pesquizas sobre a biologia da mosca da madeira** *Pantophthalmus pictus* **(Wied. 1821).** [Contributions to Brazilian agricultural Entomology. viii. Investigations on the Timber Fly, *P. pictus*.] —*Arch. Inst. biol.*, iii, pp. 249–286, 8 pls., 29 refs. S. Paulo, 1930. (With a Summary in English.)

The timber of trees infested by *Pantophthalmus pictus*, Wied. [*R.A.E.*, A, xviii, 174] is rendered commercially valueless by the many holes bored by the larvae, though the trees themselves are not killed because the holes are plugged with sawdust and sap and the orifices close a short time after the emergence of the adult. The descriptions of the adult published by various authors are quoted,

and the egg, larva and pupa are described. The fly occurs in Brazil, Paraguay and Argentina and is probably found throughout South America. The eggs are laid in cracks of the bark in batches of from 3 to 11, and hatch in 22–26 days. The noise made by the larva in boring is perceptible at a distance of 6 feet and is more intense at night. The mines are always in a transverse direction and are practically horizontal. The larvae are comparatively inactive from the end of April to the end of September. The pupal stage lasts 25–50 days, and the adult emerges from the entrance hole of the larva, total development having required 22–28 months. The flies, about 34 per cent. of which were males, lived 2–15 days in captivity.

A list of the trees attacked in Brazil is given, of which 15 are indigenous and 9 exotic. Of the former, *Platysciamus regnelli* is most often infested, *Mimosa bracatinga* var. *paucijuga* coming next, and among the exotic species the order of preference is *Casuarina*, American oak and plane. *Eucalyptus* is not attacked. Infestation usually occurs from ground level to a height of about 9 ft., but may take place up to about 45 ft. The flies prefer trees the bark of which is of the same colour as their bodies. Various ants visit the mines or destroy the newly emerged adults on the trunks. For control it is suggested that the holes should be plugged with cement.

LEONARD (M. D.). **Recomendaciones para combatir las plagas del algodón en Puerto Rico.** [Recommendations for the Control of Cotton Pests in Porto Rico.]—*Rev. Agric. Puerto Rico*, xxv, no. 4, pp. 135–136, 163–164. San Juan, P.R., October 1930.

This is a popular article describing the measures required against the commoner pests of cotton in Porto Rico.

FORBES (W. T. M.) & LEONARD (M. D.). **A new Leaf-miner of Cotton in Porto Rico (*Nepticula gossypii* new species).**—*J. Dept. Agric. Porto Rico*, xiv, no. 3, pp. 151–157, 2 pls., 1 ref. Rio Piedras, P.R., August 1930.

Nepticula gossypii, sp. n., all stages of which are described, was discovered in March 1930 mining the leaves of cotton (*Gossypium barbadense*) in Porto Rico. The eggs are laid singly on the lower surface of the leaves. In the laboratory the pupal period was passed on the lower surface of the leaves, though in the field it may be passed in the soil. The moth emerges 7–10 days after the formation of the cocoon. Adults of a black and of a yellow Chalcid have been observed on infested leaves in the laboratory.

LEONARD (M. D.). **A little-known Root-weevil of Cassava (*Coelosternus sulcatulus* Boheman).**—*J. Dept. Agric. Porto Rico*, xiv, no. 3, pp. 159–165, 3 pls. Rio Piedras, P.R., August 1930.

Notes are given on *Coelosternus sulcatulus*, Boh., which has been found attacking cassava in Porto Rico. The larvae weaken the plant and reduce the size and quality of the root by feeding on the underground part of the stem. The larval, pupal and adult stages are described. A Longicorn larva was found boring in the twigs.

SEÍN, jr. (F.). **The Sugar Cane Root Caterpillar and other new Root Pests in Puerto Rico** (*Perforadix sacchari*, **new genus and species**).—*J. Dept. Agric. Porto Rico*, xiv, no. 3, pp. 167–191, 10 pls., 18 refs. Rio Piedras, P.R., August 1930.

A Pyralid, *Perforadix sacchari*, gen. et sp. n., which was previously recorded as *Sufetula grumalis*, Schaus [*R.A.E.*, A, xv, 455] has been found throughout Porto Rico attacking the roots of sugar-cane above and below ground. This appears to be the only food-plant, although the roots of maize, bamboo and *Gynerium sagittatum* were eaten in the laboratory.

The adult is rarely observed, as it remains concealed during the day and is seldom attracted to lights at night. In the laboratory the eggs are deposited singly or in groups, and they are usually attached to particles of soil, roots, etc., the greatest number laid by one female being 164. The incubation period lasts 3–8 days in April and probably does not vary much during the year. The young larvae make holes in the tender roots or, in their absence, may tunnel in the cortex of the mature ones. The larger caterpillars feed by tunnelling in the tips of the tender roots, but live in the soil cavities. They appear to migrate from one plant to another in search of fresh root tips. After 11–19 days the larvae pupate about ½ in. below the surface of the soil. The pupal stage lasts 15–19 days, during which time any slight injury may kill the pupa. The life-cycle is completed in about a month, the generations overlapping throughout the year.

The injury is cumulative, the number of caterpillars increasing as the plantation grows. When the weather is damp and the food-supply abundant, the damage may be unimportant, but with the advent of dry weather, the output of new roots decreases, so that though the caterpillars may become less numerous, the destruction of the root tips may be in some localities the limiting factor in the growing of sugar-cane. The tunnels in the larger roots produced by the older caterpillars and the piles of whitish excrement thrown out are characteristic, but the injuries by the younger larvae may be confused with those caused by other pests. During the investigations, various new pests of sugar-cane, injury by which was found associated with that due to *P. sacchari*, were discovered. The Symphilid, *Hansiella* sp., makes round feeding holes, which are found in practically all cane roots in Porto Rico. The cavities, through which decay organisms may enter, are also found on bamboo. Bristle-tails (*Nicoletia* sp. and *Lepisma* sp.) make larger cavities at or near the tips in the tender tissues. They were also found in the roots of bamboo and *G. sagittatum*. A woodlouse (*Philoscia culebrae*, Moore) eats out irregular shallow cavities near the tip of the roots and also continues the injury caused by other pests. In the field it is usually found near the surface at the base of the cane stool. The better known root pests of sugar-cane in Porto Rico and diseases the symptoms of which might be confused with those of root injury are also discussed.

Sugar-cane will produce a satisfactory yield when the soil conditions are favourable, in spite of injury caused by root pests. The removal of dead leaves from the stalks and the burying of trash during cultivation would deprive the adults of *P. sacchari* of cover, and would also tend to restore the organic matter in the soil and enable the plant to make up for damage caused by the insect. The fertility of the land could be further increased by the growing of leguminous plants to be

ploughed under, instead of allowing the cane stubble to die out gradually and be replaced by grasses. Frequent cultivation might destroy many pupae and perhaps a few caterpillars.

MUNRO (J. A.) & RIDDLE (H. W.). **Insect Pests of Trees and Gardens.**—*Circ. N. Dakota Agric. Expt. Sta.*, no. 42, 56 pp., 46 figs. Fargo, N. Dak., April 1930.

Brief, popular notes are given on the bionomics and control of the more important insect pests of trees and gardens in North Dakota.

KING (J. L.) & HOLLOWAY (J. K.). *Tiphia popilliavora* **Rohwer, a Parasite of the Japanese Beetle.**—*Circ. U.S. Dept. Agric.*, no. 145, 11 pp., 2 figs., 4 pls., 1 ref. Washington, D.C., November 1930.

An account is given of the results of the introduction into New Jersey and adjoining States of *Tiphia popilliavora*, Rohw., for the control of *Popillia japonica*, Newm. [*R.A.E.*, A, xviii, 411]. Its bionomics are similar in the United States and Japan. The males appear at about the end of the first week in August, though females do not become abundant until about three or four weeks later. The method of oviposition is described. The female enters the soil and deposits an egg on the body of the host larva. During its life, which lasts about 22 days, a female may lay from 30 to 45 eggs, which hatch in 5–7 days. The larva of the parasite remains fixed to the body of its host, feeding upon the body fluids until it reaches the 5th or last instar, when the host larva dies. It then devours the body of its host and, 18–30 days after hatching, spins a cocoon, in which it remains in a dormant condition until pupating shortly before its emergence as an adult in the following August.

JEWETT (H. H.). **Potato Flea-beetles.**—*Bull. Kentucky Agric. Expt. Sta.*, no. 297, pp. 283–301, 24 refs. Lexington, Ky., October 1929. [Recd. December 1930.]

A detailed account is given of laboratory observations on the bionomics of *Epitrix fuscula*, Crotch, and *E. cucumeris*, Harr., with particular reference to the duration of the stages. All stages are described, but the beetles cannot be distinguished until they are adult.

The following is taken from the author's summary: *E. fuscula* is more numerous on potatoes in Kentucky than *E. cucumeris*. The beetles collect on the vines about 1st May when the plants are coming through the soil and may be found on them until the cold weather in the autumn. The life-cycle from egg to adult is practically identical for the two beetles and generally lasts 30–45 days. There were two broods in 1925 and 1928, and there is some overlapping of the broods in the middle of the summer. In the autumn, the beetles usually crawl under the litter in the fields and later hibernate in the soil.

The methods by which individuals were reared are given. Control of the beetles is difficult as they do not readily eat the sprayed leaves, but arsenical sprays kill many of them and, when combined with Bordeaux mixture, act to a considerable degree as a repellent. The plants

should be sprayed as soon as the beetles begin to collect on them; 4 lb. lead arsenate or 3 lb. calcium arsenate may be used in 100 U.S. gals. spray. If one application is not sufficient, a second should be made after 10 days.

Department of Entomology.—*Bienn. Rep. Oregon Agric. Expt. Sta. 1928–1930*, pp. 86–90. Corvallis, Ore., September 1930.

Entomological investigations conducted in Oregon during 1928–1930 included studies of the bionomics and control of *Aegeria* (*Synanthedon*) *bibionipennis*, Boisd. (*rutilans*, Edw.), which has become a very serious pest of strawberries [*R.A.E.*, A, xviii, 210]. Experiments with baits for the strawberry root weevils, *Otiorrhynchus* (*Brachyrrhinus*) *ovatus*, L., and *O.* (*B.*) *rugosostriatus*, Goeze [xvi, 23, 24], have shown that bran baits, which can be made up easily and cheaply by the growers, are as effective as any others. *Dyslobus decoratus*, Lec., which is probably the most serious root-weevil attacking strawberries in Oregon, and *D. ursinus*, Horn, have been present in destructive numbers in new localities each year. The larvae of the former are particularly active in the heat of the summer and kill the plants outright in a very short time. The adults occur as early as March, when it is difficult to apply control measures. More than 90 per cent. control of *D. decoratus* was secured in 1930 with a bait of bran and sodium fluosilicate. The native strawberry leaf beetle, *Timarcha* sp., was found to be feeding in large numbers on strawberry foliage and in some cases defoliated the plants. Two species of spittle bugs [Cercopids] were numerous in the 1930 season, when they were probably largely responsible for the poor strawberry crop.

In tests with substitutes for lead arsenate against the codling moth [*Cydia pomonella*, L.] carried out under field conditions, calcium arsenate gave as good control as lead arsenate. Of the other materials, pyrethrum gave the best results, and those secured with nicotine sulphate, and sodium and barium fluosilicates warrant further tests. Oil emulsion alone gave poor control of the larvae, but oil emulsion in combination with lead arsenate ($\frac{3}{4}$ U.S. gal. oil, 2 lb. lead arsenate, 100 U.S. gals. water) gave better control than did lead arsenate alone. Tests of the effect of varying strengths of lead arsenate confirmed previous ones [xviii, 78].

Preliminary investigations of *Diabrotica soror*, Lec., which is becoming a very serious pest of canning beans, showed that lead arsenate and other poison dusts and sprays merely act as repellents without killing many beetles, whereas pyrethrum, used at proper dilutions, killed readily when actual contact with the beetle was made. Excellent control of *Merodon equestris*, F., on bulbs was secured in 1928 and 1929 with 4–5 applications of Bordeaux-oil emulsion sprayed on the base of the plants at weekly intervals during the time that the flies were on the wing. By this method the fly is controlled before any injury has been done.

In limited experiments the addition of molasses did not increase the effectiveness of lead arsenate spray against *Syneta albida*, Lec., which causes serious injury to cherries. *Xylocrius agassizi*, Lec., and *Epochra canadensis*, Lw., continue to be very serious and destructive pests of gooseberries in Oregon, where they have almost ruined the gooseberry industry. During preliminary experiments against the Symphilid, *Scutigerella immaculata*, Newp., which is becoming increasingly in-

jurious from year to year, it was found that the female lays its eggs in batches of 15–20 at intervals throughout the season [*cf.* xviii, 78], feeding between each batch, and this suggests that clean cultivation might reduce oviposition.

CUTRIGHT (C. R.). **Apple Aphids in Ohio.**—*Bull. Ohio Agric. Expt. Sta.*, no. 464, 59 pp., 20 figs., 26 refs. Wooster, Ohio, October 1930.

The Aphids attacking apple in Ohio are *Rhopalosiphum prunifoliae*, Fitch, *Anuraphis roseus*, Bak., *Aphis pomi*, DeG., *Eriosoma lanigerum*, Hausm., and *Anuraphis bakeri*, Cowen. In the first section of this paper notes are given on the bionomics and control of the first four; *A. bakeri* is rarely found in the State and has never been of economic importance. Winged forms of *R. prunifoliae* begin to migrate from apple to cereals and grasses, on which the summer is passed, when the petals begin to fall, and all the Aphids have left the trees in about two weeks. The winged sexuparae and males return during the autumn, the bulk of the overwintering eggs being laid during late October or early November. *Anuraphis roseus* remains on apple for several generations, until late June or early July, before migrating to plantains [*Plantago*], on which the summer is passed. The fruits of apple are attacked by the third and fourth generations when the Aphids become too numerous on the foliage. The migration back to apple of sexuparae and males takes place in the autumn. The overwintered eggs of *Aphis pomi* begin to hatch when the leaves round the buds start to unfold. Most of the offspring of the stem mothers are winged forms, and many migrate to other apple trees on which the summer is passed.

The second section of the paper consists of a detailed account of the results of a study of the effects of environmental factors on *Aphis pomi*, and of experiments with summer sprays against this Aphid and with dormant and delayed dormant sprays against *Anuraphis roseus* and *Rhopalosiphum prunifoliae*. Lime-sulphur to which nicotine sulphate had been added, gave the best results against the eggs. Oil sprays were slightly more effective than lime-sulphur used alone, although both killed a large number of eggs. The addition of nicotine to oil sprays did not give an increased efficiency sufficient to justify the extra cost. In laboratory tests against young stem mothers, sprays in which oils (2 per cent.) were used as spreaders or as liberators of nicotine sulphate gave the best results. Of a number of derris products, only derrisol (1–800) gave satisfactory results, and nicotine sulphate was equally effective at a lower concentration and cost. Field tests showed that the addition of nicotine sulphate in proportions of from 1–400 to 1–800 to the late dormant lime-sulphur sprays considerably increased their effect. The strength of the nicotine is of greater importance in control than is that of the lime-sulphur.

In general, dormant and delayed dormant sprays had very little effect on *Aphis pomi*. In laboratory tests with summer sprays against it, nicotine sulphate 1–1,600 combined with $\frac{3}{4}$ per cent. miscible oil or 1 per cent. oil emulsion gave the best results. In field tests volck oil was most effective when used at 1 per cent. strength, together with nicotine sulphate, 1–1,600. No injury to the foliage occurred, and a mortality of 99·5 per cent. was obtained. Lubricating oil emulsions commonly used during the dormant period were applied to the foliage at 1 per cent. strength of the emulsion, and miscible oils at $\frac{3}{4}$ per cent. strength,

without causing appreciable injury. Penetrol, used in laboratory tests at 1 per cent. strength combined with nicotine, 1–2,000, gave 100 per cent. mortality. Further tests showed that the strength of this oil could be reduced to ½ per cent. and that the concentration of nicotine could also be lowered and good results still be obtained.

STEARNS (L. A.) & NEISWANDER (R. B.). **Oriental Fruit Moth Investigations in Ohio. I.**—*Bull. Ohio Agric. Expt. Sta.*, no. 457, 36 pp., 19 figs., 7 refs. Wooster, Ohio, September 1930.

A progress report is presented of an investigation on *Cydia* (*Laspeyresia*) *molesta*, Busck, carried out in Ohio during the years 1927, 1928 and 1929 [*cf.* *R.A.E.*, A, xvi, 456; xviii, 38, 388, 419, 550]. Five broods of eggs and larvae were developed in southern Ohio in 1927, and four in 1928 and 1929. Studies of early seasonal development indicate that both pupation and emergence of the overwintered generation occur 1–2 weeks later in central, and 2–3 weeks later in northern, than in southern Ohio. The variation of 45·5 days between the median emergence on Lake Erie and that on the Ohio river is sufficient to account for the occurrence of one brood less annually in the extreme north of the State.

The moths are normally most active during the evening, the heaviest oviposition occurring between the hours of 6 and 9. Approximately 95 per cent. of the eggs deposited on peach foliage are on the lower surface of the leaves. Newly hatched larvae entered apples in an average of 1¼ hours, ingesting little or none of the surface tissue. Apples were superior in every respect as a rearing medium, although the average length of the feeding period in this fruit was 16·7 days as compared with 13·8 in peaches.

No spray sufficiently penetrating and toxic to prove effective during the dormant season has yet been discovered. It appears that any effective control against the hibernating population present in the upper parts of the tree [*cf.* xv, 261] might prove disastrous in reducing still further the percentage of parasites surviving from year to year, since most of the parasitised twig-feeding larvae seem to hibernate in this position.

PETERSON (A.). **A biological Study of *Trichogramma minutum* Riley as an Egg Parasite of the Oriental Fruit Moth.**—*Tech. Bull. U.S. Dept. Agric.*, no. 215, 21 pp., 9 figs. Washington, D.C., November 1930.

This bulletin summarises the results of three years' study of the biology of *Trichogramma minutum*, Riley, as a parasite of *Cydia* (*Laspeyresia*) *molesta*, Busck, almost all the data referring to the form that has distinct lemon-yellow females during the warm part of the active season [*R.A.E.*, A, xviii, 369]. In New Jersey, where the studies were conducted in a large screened insectary in a peach orchard, the parasites being reared in glass vials by a method which is described, there is apparently a maximum of 13 generations, from one to several individuals developing in the eggs of *C. molesta* or *C.* (*Carpocapsa*) *pomonella*, L. The parasite has been carried through the winter out of doors in eggs of *C. molesta*, *Ephestia kühniella*, Zell., and *Thyridopteryx ephemeraeformis*, Haw.; the winter host in nature is un-

known. Emergence of the parasite occurs in early April and may continue as late as December or January. Fertilised females produce more females than males ; unfertilised ones produce only males. Adult parasites live from 1 to 12 days in mid-season, completing oviposition within the first day or two if hosts are available. One female was observed to parasitise as many as 131 eggs, the average being about 38. Eggs of *Cydia* that have completed two-thirds of their development are not susceptible to attack. The life-cycle varies in length according to the temperature, requiring from 7 to 75 days or longer, and generally occupying from 9 to 16 days in warm weather. The ratio of change in the life-cycle period at average temperatures of from 60 to 75° F. is approximately 1 day decrease for each 1·25° increase in the average temperature. For optimum conditions the temperature should average 80° F., with a humidity of 70–80 per cent., readily accessible host material and plenty of artificial light or indirect sunlight. Preliminary field tests in a peach orchard indicate that liberations of 1,000 adults in a tree are not sufficient to give rise to parasitism among eggs in adjacent trees.

ALLEN (H. W.) & LOTT (E.). *Epiblema strenuana* **Walk., the Host of certain Parasites of the Oriental Fruit Moth,** *Laspeyresia molesta* **Busck (Lepidoptera).**—*Proc. Ent. Soc. Wash.*, xxxii, no. 7, pp. 135–136. Washington, D.C., 1930.

Epiblema strenuana, Wlk., has been found to serve as an alternative host for several of the more important parasites of *Cydia molesta*, Busck, including *Macrocentrus ancylivora*, Roh., *M. delicatus*, Cress., *Glypta rufiscutellaris*, Cress., *Pristomerus ocellatus*, Cush., and *Cremastus minor*, Cush. It is widely distributed in the stems of ragweed (*Ambrosia artemisiaefolia*) in the second half of the summer, when most of the larvae of *Cydia* are inaccessible to parasites. Of 284 borers from ragweed collected in New Jersey between 13th August and 3rd September, 10 per cent. were parasitised by *M. ancylivora*, 23 per cent. by *M. delicatus*, 18 per cent. by *G. rufiscutellaris* and 5 per cent. by *P. ocellatus*. Numbers of *G. rufiscutellaris* and *M. delicatus* were reared from *Epiblema* in Pennsylvania, Ohio and Indiana, and *P. ocellatus* in Pennsylvania and Ohio.

[WALLACE (F. N.).] **Report of the Division of Entomology.**—*Yearb. Dept. Conservation Indiana 1929*, reprint, 35 pp. Indianapolis, Ind., 1929. [Recd. December 1930.]

The situation in Indiana with regard to the European corn borer [*Pyrausta nubilalis*, Hb.] during the years 1928 and 1929 is shown in tables. The degree of infestation increased considerably, even in areas where the maize after cutting is put into a silo or shredded (practices that kill practically all the borers present) ; where the fodder is allowed to remain in the field, the rate of increase of the borer must be greater. The use of the new low-cutting knife is strongly advocated.

The records of nursery and apiary inspections are given, as well as lists of insects on trees and shrubs, and in greenhouses, market-gardens, flower-gardens and houses. Regulations for certification require that trees the roots of which bear knots or galls caused by the woolly apple aphis [*Eriosoma lanigerum*, Hausm.] must not be sent from the

nursery, and other trees visibly infested with this Aphid must not be sent out unless the tops and roots have been dipped in a solution of 9 oz. nicotine sulphate (40 per cent.) in 50 U.S. gals. water with the addition of ½ U.S. gal. boiled lubricating oil emulsion or 1½ lb. soap. *Cydia* (*Laspeyresia*) *molesta*, Busck (oriental fruit moth) has spread in the southern part of the State, causing damage in both nurseries and orchards. *Tyloderma fragariae*, Riley (strawberry crown borer) has become a serious pest, especially in stock grown for propagation, of which from 1 to 50 per cent. has been found to be damaged. The native weeds, *Potentilla monspeliensis* and *Duchesnea indica*, are alternative food-plants. To prevent infestation, only young plants formed from runners of the previous season should be used, and all strawberries should be transplanted before 16th March. *Longitarsus waterhousei*, Kutsch (mint flea-beetle) caused a severe infestation over about 175 acres of mint, lowering the oil yield and stunting or killing the plants. The adults feed on the leaves, but the larvae, which hatch in the soil and feed on the rootlets, cause the greatest damage. There is only one generation a year, adults appearing in July and oviposition beginning 3 or 4 weeks later; the eggs remain in or on the soil through the winter, and the larvae hatch during May, pupating after about a month. Roots for planting should be taken from an uninfested field or have all the soil removed from them. Before harvest the plants should be dusted with 1 part calcium arsenate to 4 parts talc, at the rate of 50 lb. to the acre, and, as mint is normally harvested before the oviposition period, it may be necessary to dust the stubble, for which 5 lb. Paris green to 95 lb. cheap flour may be used at the rate of 30 lb. to the acre.

Johnson (J.) & Hoggan (I. A.). **The Challenge of Plant Virus Differentiation and Classification.**—*Science*, lxxiii, no. 1880, pp. 29–32. New York, N.Y., 9th January 1931.

One of the most useful methods of differentiating plant viruses, which possesses great possibilities for expansion within closely related groups, is that based on the study of insect transmission. The development of such a method, particularly in the case of viruses not readily transmissible by artificial means, may eventually serve to complete a satisfactory key for the determination of plant viruses in general. There are at least three specific conditions affecting transmissibility by an insect, namely, the species of insect involved, the specific virus concerned and the species of plant serving as a source of infection. Possibly the species of plant liable to infection may add to the possibilities of differentiation. Many cases of specific relationship between the virus and its insect vector are known, and there are others where the relationship is less specific [*cf.* *R.A.E.*, A, xvii, 598].

Munro (J. A.). **Bertha Army-worm Control.**—*Bull. N. Dakota Agric. Expt. Sta.*, no. 233, pp. 73–75, 1 fig. Fargo, N. Dak., March 1930.

Barathra configurata, Wlk., which has one generation a year and overwinters in the pupal stage, first became a pest of major importance in North Dakota in 1928, having caused injury to fields of flax and sweet clover by stripping off the leaves and pods during July and August. The larvae enter the soil at the end of August and pupate at a depth of about 2 ins. Most of the adults emerge in the second

half of June and oviposit on the leaves of the food-plants. Cultivation of the soil in autumn would expose the pupae to natural enemies and unfavourable weather and kill a large number by crushing. In preliminary tests, dusting with lead arsenate, calcium arsenate or Paris green, mixed with hydrated lime (1 : 7), killed a fair percentage of the younger larvae.

Felt (E. P.). **The Norway Maple** *Nepticula* **(Lepidoptera).**—*Proc. Ent. Soc. Wash.*, xxxii, no. 8, pp. 146–149. Washington, D.C., 1930.

An account is given of further observations [*cf. R.A.E.*, A, xviii, 728] on *Nepticula sericopeza*, Zell., which has been found in large numbers in various parts of the north-eastern United States mining in the leaf-stems and seeds of Norway maple [*Acer platanoides*]. The adult, larva and cocoon and the appearance of the infested leaf-stems and seeds are described. There are at least two and possibly three generations during the year. Observations indicate that this Tineid is probably unable to complete its development in the leaf-stems, and that the latter only become infested when the seeds are not available for oviposition. Attempts to breed the moths from infested leaf-stems failed, whereas they were reared in large numbers from infested seeds in the laboratory. Since hibernation occurs in cocoons on the trees, it is probable that a dormant oil would practically eliminate an infestation. A spray of ½ U.S. pint nicotine, 3 lb. soap, and 2 U.S. qts. molasses to 40 U.S. gals. water, applied late in May, killed the adults and probably also prevented their emergence from the cocoons.

Fisher (W. S.). **A new Species of** *Chrysobothris* **infesting Strawberry Plants (Coleoptera : Buprestidae).**—*Proc. Ent. Soc. Wash.*, xxxii, no. 8, pp. 149–152. Washington, D.C., 1930.

Chrysobothris fragariae, sp. n., has been reared from strawberry plants in Idaho. It is closely allied to *C. pubescens*, Fall., with which it has been confused in the past.

Keifer (H. H.). **Notes on Lesser Bulb Flies in California.**—*Mon. Bull. Dept. Agric. California*, xix, no. 11, p. 760. Sacramento, Cal., November 1930.

Eumerus strigatus, Fall., which up to 1928 was not known to occur south of Oregon, was taken in California in grapefruit and tomatos in 1929 and in carrots in 1930.

Wilson (J. W.). *Tibicen davisi* **Smith and Grosbeck (Cicadidae) a new Pest of economic Importance.**—*Florida Ent.*, xiv, no. 4, pp. 61–65. Gainesville, Fla., December 1930.

In one locality in Florida, *Tibicen davisi*, Sm. Grsb., has become sufficiently abundant to cause noticeable damage to *Asparagus plumosus* in ferneries. Males were first taken in August, few females being observed before 8th September. After this date large numbers of both sexes emerged daily, reaching a maximum between 16th and 30th September ; individuals continued to emerge until the middle of October. Adults in screen cages placed over plants of *A. plumosus*

all died within 48 hours, and as they have never been observed feeding on this plant, it is suggested that they leave the fernery to feed and pair, and that the females return to deposit their eggs. Eggs are laid on almost any plant material available, but the dried and seasoned timber of which the sheds are constructed is distinctly preferred. A single female may drill as many as 25–30 holes in a row, placing 5–12 eggs in each one. Eggs deposited as early as 8th September had not hatched by 13th November, so that it is assumed the winter is passed in the egg stage, and that when the young nymphs hatch they drop to the ground and make their way to the roots of the plant, where they form a cell and begin to feed. In June only a few third stage nymphs were found, but large numbers of the fourth and fifth stage were collected. They were usually taken about 6 ins. below the surface of the soil, directly beneath the crown of a plant. They are found on *A. plumosus* at a depth of 8 ins., this being the maximum depth at which this plant produces roots or crowns. In August and September many full-grown fifth stage and some fourth stage nymphs were taken, and it is assumed that the nymphs pass the winter in one of these stages.

Of the numerous insecticides tested, carbon bisulphide alone was effective to any extent. An emulsion of 1 part fish-oil soap, 3 parts water and 10 parts carbon bisulphide was diluted with 96 parts water, and 3 U.S. pts. of the dilute solution was applied to each square foot of soil. This treatment gave good control of fourth stage nymphs, but had no noticeable effect on those in the fifth stage. A higher concentration of the insecticide injured the plants. Good results were also obtained by treating the soil with water at about 80 lb. pressure. The stream of water thoroughly disturbs the soil and penetrates to a depth of 12 ins. or more. Large numbers of nymphs are forced out on to the surface and left to dry up and die, and many are hit directly by the spray and torn to pieces. A few of the larger nymphs escaped, but all of these emerged as adults in September. Various materials were applied to the shed in September in an attempt to prevent the females from depositing their eggs in the timber. Whitewash proved the most effective, but might not be so satisfactory if used on a large scale.

GROSSMAN (E. F.). **Biology of the Mexican Cotton Boll Weevil. VI. Some Humidity and Temperature Effects on Development and Longevity.**—*Florida Ent.*, xiv, no. 4, pp. 66–71, 1 ref. Gainesville, Fla., December 1930.

Owing to the difficulty encountered in keeping adults of *Anthonomus grandis*, Boh., alive in low temperature incubators equipped with brine coils, experiments were undertaken to determine the optimum range of relative humidity necessary for successful hibernation in artificially cooled environments. Relative humidities ranging from 1 to 100 per cent. were obtained by means of sulphuric acid solutions. The length of life of adult weevils was determined at various temperatures from 2 to 27° C. [35·6 to 80·6° F.], and data on hatching and development at 21 and 27° C. [69·8 and 80·6° F.], with 16–19 different humidities, the results being shown in detail in tables. For a period of several days the adults can withstand any percentage of humidity, though a range between 61 and 98 is necessary for continued activity.

Calhoun (P.). **Time of hatching first Generation Boll Weevils relative to Appearance of Blossoms.**—*Florida Ent.*, xiv, no. 4, pp. 72–75, 1 chart. Gainesville, Fla., December 1930.

The time of dusting is of great importance in the control of the cotton boll weevil [*Anthonomus grandis*, Boh.]. Thus, in cases where the hibernating weevils were not poisoned when the cotton plants were small, first generation weevils may emerge in sufficient numbers to puncture a considerable percentage of young bolls before a dust is applied. In order to be able to predict when the first generation weevils might be expected to emerge, squares of an upland and a sea-island variety of cotton were measured between 29th May and 6th June, and the time between the date of measuring and the date of blossoming was recorded and correlated with the period required for a weevil to develop from the egg in the field in Florida, *i.e.*, 21–22 days. It was found that for a weevil to emerge from the upland cotton before blossoming time, it would have to develop from rather small squares of about 4·5 mm. in diameter at the time of oviposition. Weevils do not ordinarily develop in squares smaller than this, as very small squares dry so readily after they fall from the plants that the larvae they contain die. On the other hand, weevils of the first generation may easily emerge within 3 or 4 days after the first blossoms appear, as squares of 5·5–6·0 mm. can easily produce weevils in that time except under unfavourable weather conditions. Although only one variety of upland cotton was tried, it is thought that other standard varieties would not show sufficient differences to be of importance. Some of the sea-island varieties, however, might possibly have a pre-bloom period sufficiently long to permit first generation weevils to begin emerging several days before the first blossoms appear. Ordinarily they do not emerge so early in sufficient numbers to cause damage, as a large percentage of the eggs first laid are killed by the hot sun before the cotton plant is large enough to furnish sufficient shade. On the other hand, if rainy weather prevails from the time the infested squares begin to fall, and no hot, sunny weather occurs, first generation weevils begin to emerge by the time the blossoms appear or shortly afterwards, and may easily become sufficiently numerous within three weeks to puncture many of the bolls.

Marcovitch (S.) & Stanley (W. W.). **The climatic Limitations of the Mexican Bean Beetle.**—*Ann. Ent. Soc. Amer.*, xxiii, no. 4, pp. 666–686, 4 figs., 18 refs. Columbus, Ohio, December 1930.

The following is taken largely from the authors' summary and conclusions: A study of the climatic requirements of *Epilachna corrupta*, Muls. (Mexican bean beetle), the phenomenal spread of which in the eastern United States has been attributed to the prevailing wind, indicates that there are very definite limits of temperature and moisture that favour its development and determine its potentialities as a crop pest as well as its ability to spread into new territory. The tablelands of Mexico and Central America, which are its original habitat, possess a uniform, cool climate, with maximum temperatures of 75° F., to which the beetle is best adapted. Experimental work indicates that temperature exerts a more powerful influence than humidity on the

development of the beetle [*cf. R.A.E.*, A, xvii, 365; xviii, 492]. Temperature and relative humidity are interdependent and vary inversely, high temperatures producing low humidities. The low humidities are fatal to the beetle only as the temperature is increased beyond 77° F., which has been shown by breeding studies to be the most favourable to survival with a relative humidity of 80 per cent. Higher temperatures, although hastening development, produced greater mortality. At a constant temperature of 93° F., none of the larvae were able to develop, and at 100° F. the small larvae succumbed in 8 hours. At 77° F. with relative humidities of from 58 to 100 per cent., practically no mortality occurred, the beetles living for several days. Details are given of studies carried out to determine the relative length of each stage of *E. corrupta* at various constant temperatures. The average total length of time taken for development from egg to adult varied between 26·8 days at 86° F. and 83 days at 59° F.

Observations during the past 5 years under outdoor conditions show that the high temperatures prevailing at midsummer are often very unfavourable to the development of *E. corrupta*. The following formula was used to measure the effect of drought: $L \times \frac{L}{2} \times \left(\frac{100}{R}\right)^2$ where L is the total number of two or more consecutive days above 90° F. and R is the rainfall in inches for June-September inclusive. With the aid of this formula, the climatic index number of representative localities was determined. Regions with an index number of 2,000 or less appear favourable to the beetle. By the aid of these index numbers, a map was prepared showing the probable future spread of *E. corrupta*. Localities with extremely hot summers will be exempt from depredations, and those subject to droughts will often be free from attack except in a series of favourable years. Cool, humid regions are most favourable to the beetle and will suffer accordingly.

Brindley (T. A.). **The Growth and Development of** *Ephestia kuehniella* **Zeller (Lepidoptera) and** *Tribolium confusum* **Duval (Coleoptera) under controlled Conditions of Temperature and relative Humidity.** —*Ann. Ent. Soc. Amer.*, xxiii, no. 4, pp. 741–757, 4 charts, 9 refs. Columbus, Ohio, December 1930.

The growth and development of *Ephestia kühniella*, Zell., and *Tribolium confusum*, Duv., was followed by means of a detailed study of the length of each instar; weights taken at 3-day intervals during the period of larval development; measurements of the length of the larvae near the end of each instar; and head capsule measurements of each instar. The life-history of 100 individuals of each species was determined at a temperature of 30° C. [86° F.] and a relative humidity of 73 per cent., both insects having six larval instars. Emergence studies showed the average length of the life-cycle of *E. kühniella* to be 41 days, and that of *T. confusum* 29 days, emergence extending over periods of 16 and 5 days respectively. *E. kühniella* was found to lay an average of 187 eggs over a period of 8 days. *T. confusum* averaged 10 eggs a day, but the length of the oviposition period was not determined.

McAllister, jr. (L. C.) & Van Leeuwen (E. R.). **Laboratory Tests of miscellaneous Chemicals against the Codling Moth.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 907–922, 6 refs. Geneva, N.Y., December 1930.

The following is taken from the authors' summary: A total of 283 organic compounds was tested in the course of an investigation having as its object the discovery of a substitute for lead arsenate in the control of *Cydia* (*Carpocapsa*) *pomonella*, L. The tests were made by placing newly hatched larvae, of which a total of 49,960 were used, on apples to which the various materials had been applied in such a manner that it was impossible for them to enter the fruit without first passing through the poison. About 50 of the materials showed an efficiency of 70 per cent. or over and have been selected for further trial.

Yothers (M. A.). **Further Results with Trap Baits for capturing the Codling Moth.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 923–929, 2 refs. Geneva, N.Y., December 1930.

The following is taken from the author's abstract and conclusions: In the fifth year's tests, made in 1928 in a severely infested apple orchard at Yakima, Washington, with trap baits for the capture of *Cydia* (*Carpocapsa*) *pomonella*, L. [*cf. R.A.E.*, A, xviii, 574, etc.], the most promising of several kinds of bait compared were malt syrup, cane molasses, beet molasses, and brown sugar and geraniol. Dilutions of 1–10 are probably only slightly more efficient for most of these baits than dilutions of 1–20. Variations in temperature had a greater effect upon the number of moths captured than had the dilutions of the materials. Geraniol added to brown sugar and water and to beet molasses increased the effectiveness of these materials. Comparative tests were also made with various yeasts for starting fermentation and with boric acid for preventing it, but the results secured were too variable to warrant any conclusions. A comprehensive test to determine the most efficient number of traps showed that the number of moths captured per trap increased with the number of trees from which moths could be attracted, but not in direct ratio. Not more than two trees should be allowed to a trap. These tests definitely showed that great numbers of moths can be caught with bait traps in badly infested orchards.

Yothers (M. A.). **A Comparison of untreated Banding Materials for capturing Codling Moth Larvae.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 930–936, 2 figs., 1 ref. Geneva, N.Y., December 1930.

In comparative tests of several kinds of untreated bands for capturing the larvae of *Cydia* (*Carpocapsa*) *pomonella*, L., on apple trees at Yakima, Washington, in 1927 and 1928, a paper-burlap band (made by fastening tough paper to thin burlap, with a light and waterproof coating between them) proved equal or superior to the 3-ply burlap one customarily used, and the cost was less. Single-thickness 8-inch paper-burlap bands were apparently more effective than 4-inch ones; folding 8-inch bands to double thickness with the open edge downward did not increase their effectiveness. The effectiveness of the 4-inch bands was slightly reduced when folded, the 2-inch band thus formed being apparently too narrow. Three-ply 4-inch burlap proved more efficient than 2-ply

of 6 or 8 inches in width. Heavy roofing paper was the least effective, and crêpe paper, light coloured, single thickness, 4 inches wide, was next to the least effective in two tests in 1927, and was the least effective in 1928. Paper-burlap bands, 4 ins. wide, were apparently somewhat more effective when attached on both trunk and limbs than on the trunks alone. In an unsprayed block in 1927, the larvae captured averaged 167–258 to a band for the season, and in 1928 in another unsprayed orchard, larvae caught by the bands averaged 336–1,322 to a band for the period 10th July–14th November.

NEISWANDER (C. R.) & HERR (E. A.). **Correlation of Corn Borer Population with Degree of Damage.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 938–945, 2 figs. Geneva, N.Y., December 1930.

In view of the importance of estimating the amount of damage caused to maize by infestations of *Pyrausta nubilalis*, Hb., which is discussed, studies were carried out in Ohio in 1928 on different plots of each of three varieties of maize. It was found that within the variety there was a direct correlation between borer population (established in the egg stage) and reduction in yield, and that for the three varieties under observation there was an inverse correlation between the percentage of reduction in yield and the length of season between planting and silking. The results of the investigation reported however indicate that no specific formula based upon the borer population per stalk alone is likely to be established for measuring damage that will apply to all varieties, soils, planting dates, seeding rates, crop rotations and weather conditions, and these factors render it improbable that the same populations placed on the same varieties would produce identical results in another year. Nevertheless the amount of damage per average borer can be correlated in a general way with the nature of the variety.

MILLER (D. F.). **The Effect of Temperature, relative Humidity and Exposure to Sunlight upon the Mexican Bean Beetle.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 945–955, 4 figs., 9 refs. Geneva, N.Y., December 1930.

Laboratory and field experiments indicate that there is a specific relation between humidity and temperature in the survival of *Epilachna corrupta*, Muls., at high summer temperatures. The apparatus used in the laboratory experiments is described. The first experiment indicated that at normal summer temperatures with no sudden or great variations [73–88° F.] and with relative atmospheric humidities varying from 0 to 100 per cent. and relative evaporation rates of 1·06 cc. to 25·14 cc. per day, *E. corrupta* is sufficiently resistant to pass through its final ecdysis, pupation and emergence with no apparent effect from the abnormal conditions. The adults, larvae and pupae were then exposed separately for three hours to temperatures varying from 37·5 to 42·5° C. [99·5 to 108·5° F.] at different relative humidities (0, 30·72, 56·18, 73·414 and 100 per cent.). At 99·5° F., there was a normal survival at all humidities; for a rise of 1·8° F. there was a marked kill below 60 per cent. and above 80 per cent. relative humidity, with a very decided optimum at 73 per cent. For higher temperatures up to 41·5° C. [106·7° F.] the results were very similar, with a decidedly lower percentage of survival for each degree of temperature. For a temperature of 108·5° F. there was an almost complete kill at all

humidities. Regardless of the temperature, the optimum humidity is near 73 per cent. The temperatures used are within the range for an occasional hot period in the United States from Ohio southwards, and are well below the temperature frequently reached at the surface of the ground when exposed to the summer sun. The three-hour exposure was chosen as representing the probable duration of high temperature for any one day.

In field tests in which pupae were exposed to bright direct sunlight, only 32 per cent. (as compared with 91 per cent. of the controls) emerged after three hours' exposure to high temperature, exposure for 15–18 hours having practically no effect when the temperature was not high. It appears that temperature is more important than light rays in the field. Further observations indicate that light is the most important factor influencing the beetles in their orientation upon their food-plant, the upper surface of the leaf being selected in preference to the lower, on which they are normally found, when the latter was exposed to bright light. When light is not concerned, the beetles may respond to gravity, leaf surface, ability to feed or temperature.

Lehman (R. S.). **A Comparison of the Toxicity of Paradichlorobenzene and Naphthalene to the Confused Flour Beetle** (*Tribolium confusum* **Duv.**) (**Coleoptera**).—*J. Econ. Ent.*, xxiii, no. 6, pp. 958–966, 5 figs., 12 refs. Geneva, N.Y., December 1930.

Experiments are described in which large numbers of *Tribolium confusum*, Duv., were treated under controlled conditions with naphthalene and paradichlorobenzene. The apparatus, which is described in detail, consisted chiefly of a closed system in which air was drawn over sulphuric acid to give the desired humidity and then through the compound before going through the exposure bottles, the entire system being confined in a constant temperature chamber maintained at 30° C. [86° F.]. A relative humidity of 60 to 70 per cent. was obtained by the use of saturated sodium chloride solution. The anaesthetic properties of saturated paradichlorobenzene were found to be so strong that individuals of *T. confusum* were still anaesthetised when examined at the end of 24 hours, though large numbers had recovered at the end of a week. Based on the time required to kill 50 per cent. of the insects, naphthalene appeared to be 14 times as toxic to *T. confusum* as paradichlorobenzene of the same concentration in an experiment carried out in the autumn of 1929, but only 10 times as toxic in another carried out in the winter of 1930. The difference may be due to the greater resistance of *T. confusum* at this time of year, or to a difference in the anaesthetic properties of the paradichlorobenzene used.

Smith (R. C.) & Audant (A.). **The more important injurious Insects of Haiti.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 972–979, 9 refs. Geneva, N.Y., December 1930.

A list, mainly arranged under food-plants, is given of the more important insect pests in Haiti, notes on abundance being added where such information is available. A brief summary of the main geographical, phenological and agricultural features of Haiti is given. Both vegetation and insect fauna show a mingling of temperate and torrid zone forms, particularly at the higher altitudes. Some insects that might be expected to occur in Haiti, but have never been recorded there, are also mentioned.

Farrar (M. D.) & Smith (M. A.). **Some physical Properties of certain Dormant Oil Emulsion-Sulphur Combinations.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 979–985, 2 pls., 8 refs. Geneva, N.Y., December 1930.

A description is given of a recently developed dormant tree spray, which has been used with complete safety on peaches, apples, plums and small fruits. It consists of a type of oil emulsion known as L.21, containing an 83 viscosity (100° F.) lubricating oil emulsified with a gum, and a precipitated sulphur termed " flotation sulphur " obtained in the manufactured gas industry [*cf. R.A.E.*, A, xviii, 202] by a process known as liquid purification. When this emulsion and sulphur were combined directly, the physical properties were superior to those of a combination in which excess water was added at the time of mixing. Oils emulsified with gum in combination with sulphurs were found to be superior physically to those emulsified with potassium fish-oil soap, potassium caseinate and petroleum soaps. Sulphur particle size was shown to be a minor factor in the combinations of oil emulsion and sulphur used. Flotation sulphur at various stages in its purification contains electrolytes in small quantities. These electrolytes were found to impart to the flotation sulphur the property of adherence to the oil droplets. Laboratory experiments indicated that the most desirable physical properties of the combination were obtained when from 4 to 6 lb. flotation sulphur (dry basis) were combined with 1½ U.S. gals. oil emulsion and diluted with 50 U.S. gals. water, and three years' field data showed that with 5 lb. sulphur this combination was highly efficient in the control of the San José scale [*Aspidiotus perniciosus*, Comst.] and peach leaf curl.

Roark (R. C.) & Nelson (O. A.). **Densities of Mixtures of Air and various Fumigants.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 985–987, 9 refs. Geneva, N.Y., December 1930.

A formula is given for the calculation of the densities and specific gravities of saturated mixtures of air and vapours of liquid or solid fumigants, for which the simple calculations based on the molecular weight of the compound in relation to the standard conditions of 760 mm. pressure and 0° C. [32° F.], applicable only to gaseous fumigants, cannot be used. The density and specific gravity of such a mixture for 28 compounds calculated according to this formula, on the basis of air at 25° C. [77° F.] and 760 mm. pressure and dosage at pounds per 1,000 cu. ft., are shown in a table. Only 4 of these compounds give mixtures with air that have densities less than that of pure air, and of these hydrocyanic acid is the only one commonly used against insects. From this it may be seen that, in the absence of air-mixing devices, it is generally preferable to apply a fumigant from the top of the chamber, so that the heavier vapours fall and are more evenly distributed.

Shirck (F. H.). **A Soil-washing Device for Use in Wireworm Investigations.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 991–994, 1 pl., 1 fig., 1 ref. Geneva, N.Y., December 1930.

An apparatus for separating the eggs and young larvae of wireworms from field samples of soil is described. The washer, which is similar

to that designed by Morris [*R.A.E.*, A, x, 527] but simpler in construction, consists of a wooden rack to hold a series of sieves of 10-, 16-, 30-, 40- and 50-mesh, a hose equipped with an adjustable nozzle, and a small funnel-shaped sieve with interchangeable screen bottoms for collecting the residues from the various pans after washing. Practically all the eggs were retained in the 40-mesh screen, the finest being required only for newly hatched larvae. The lowest pan has a solid bottom and serves to catch the water, which is led away through a drain. Three large and three small pans were used, the smaller fitting into the larger with a space of $1\frac{1}{2}$ ins. between the two bottoms. Short spouts were soldered into the lower pans near the bottom to facilitate draining, corks being used to stop the openings. When washing is completed, the material to be examined is collected by removing the cork and flushing the residue out into the funnel sieve, the mesh used in the bottom of the funnel corresponding to that of the pan being cleared. After the water has been shaken out, the material is emptied from the sieve into a 2-oz. salve box for examination. About 8 lb. of soil can be washed at a time, and six of such samples can be passed through the sieve in an hour.

BURRELL (R. W.). **An Humidity Apparatus.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 994–997, 2 pls. Geneva, N.Y., December 1930.

The apparatus described is adaptable for use in almost any situation requiring the production of humidity on a large scale. The principle utilised is the blowing of air through and round wet discs of 4-mesh galvanised screening. The air is furnished by a fan the mechanism of which also furnishes the power to rotate the screens, which are mounted on a shaft that passes through their centres, and separated by small blocks of wood. As the screens rotate, their lower edges pass through water in a shallow pan, and small metal cups, soldered between each pair of screens, help to keep them thoroughly wet. The screens and fan are enclosed in a cylindrical housing of galvanised sheet iron.

SCARAMUZZA (L. C.). **Preliminary Report on a Study of the Biology of** *Lixophaga diatraeae* **Tns.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 999–1004, 5 refs. Geneva, N.Y., December 1930.

Life-history studies of *Lixophaga diatraeae*, Towns., the most important larval parasite of *Diatraea saccharalis*, F., on sugar-cane in Cuba [*R.A.E.*, A, xviii, 167], show that the adults live as long as 40 days in captivity when supplied with abundant moisture at a temperature of 85° F. Loaf sugar stuck to the sides of the cage with paraffin wax was found to be the best food. Five larvae of *D. saccharalis*, known to be unparasitised, were introduced into a cage containing a number of parasites that had emerged from puparia collected in the field, and larvae of *L. diatraeae* emerged from 2 of them 14 and 16 days after they had been exposed for 3 days to the flies. Dissection of gravid females showed that *L. diatraeae* is larviparous, and it was found that host larvae could be inoculated by placing on them larvae from dissected females. Larvae secured by dissection and kept alive in a saline solution for 23 hours were able to enter the host and develop normally. There are three larval instars, which are

described ; during part of the first and second the larva is attached to the trachea of the host, whereas in the third it is always free within the host body. The pre-larviposition period lasts 6–7 days, the larval 5·5–13, and the pupal 9–11. Breeding is continuous throughout the year under Cuban conditions, and there are probably 8–10 generations, corresponding closely with those of the host.

Normally *D. saccharalis* appears to be parasitised between the third and fifth larval instars, but the parasite has been reared from the second instar, and emergence has been delayed until after the pupation of the host. Sometimes two parasites, and very rarely three, developed in borers collected in the field and parasitised naturally. Under laboratory conditions, when borers were inoculated with several larvae, all but one were usually killed during the second instar, and in only one instance did two reach maturity. The borer larvae die from 6 to 48 hours before the emergence of the parasite. Pupation takes place within a few hours of emergence in summer, but may be delayed 24 hours or more in winter ; the puparia are usually found in a dry place near the opening of the borer tunnel or between the leaf sheaths and stalk. The pupal stage may be prolonged to 30 days by refrigeration. The adults of *L. diatraeae* are found resting on cane plants or feeding on pieces of cut cane, and have never been taken at other places or feeding on flowers. Their natural food is probably honey-dew, which is abundant on cane from the Homoptera present on it. Larviposition has not been observed but young larvae placed on a cane stalk rapidly entered borer holes, and were found inside borer larvae when the canes were opened and the borers dissected 2–3 hours later. It is probable that the parasites reach the borers in this manner, as it is unlikely that the maggots are deposited directly on their bodies.

BACK (E. A.) & REED (W. D.). *Ephestia elutella* **Hubner, a new Pest of cured Tobacco in the United States.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 1004–1006, 21 refs. Geneva, N.Y., December 1930.

Ephestia elutella, Hb., was found infesting stored leaf tobacco in a small number of warehouses in Richmond, Virginia, in August 1930. Although the destruction of the leaf was very pronounced and widespread throughout about 8,000,000 cu. ft. of storage space, infestation was confined to a small area and did not extend to stocks in storage in other parts of the city or elsewhere, and the pest has already been greatly reduced by the application of control measures. Reference is made to the occurrence of *E. elutella* in stored tobacco in other parts of the world [*R.A.E.*, A, iii, 613 ; xviii, 532], and the countries in which it has been recorded and other stored products on which it is known to feed are given.

SNAPP (O. I.) & THOMSON (J. R.). **Oriental Fruit Moth Infestation in Georgia Peach Belt.**—*J. Econ. Ent.*, xxiii, no. 6, p. 1007. Geneva, N.Y., December 1930.

In order to determine the extent to which peaches are infested by the oriental fruit moth [*Cydia molesta*, Busck] in the Georgia peach belt, where a heavy mortality is caused by the absence of a food-plant after mid-summer, all fruit from 50 trees in an orchard where no control measures had been practised was examined after the larvae had ceased to work on the twigs on account of their hardened condition, and only 1·3 per cent. was found to be infested.

Flanders (S. E.). **A Suggestion for the automatic Collection of** *Sitotroga.*—*J. Econ. Ent.*, xxiii, no. 6, p. 1008. Geneva, N.Y., December 1930.

An apparatus has been devised for use in conjunction with the moth trap recently described [*R.A.E.*, A, xix, 96], to reduce time and labour in making daily collections of the adult stage of the host [*Sitotroga cerealella*, Ol.] of *Trichogramma* [*minutum*, Riley]. Bins containing infested maize, when stacked in position, are covered with a single piece of closely woven cloth, hanging loosely from the cover of the top bin and securely fastened on all sides to prevent the escape of moths. The lower edge is attached to a funnel having an opening 1 in. wide extending the width of the bins and on a level with and attached to the bottom of the bin. The lower or small end of the funnel is connected with the moth trap. When in operation, a constant current of air enters at the top of the enclosure formed by the cloth and passes down between the bins through the mass of grain and out through apertures at the lowest part of each bin, causing the cloth to bulge outward. The moths that accumulate in the cloth enclosure are collected at intervals in the trap by turning the air pressure on and off rapidly several times so as to shake the cloth, causing the moths to settle in the funnel, and at the same time starting the suction motor on the trap.

Sakimura (K.). **A predacious Mite on Alfalfa Thrips.**—*J. Econ. Ent.*, xxiii, no. 6, p. 1009. Geneva, N.Y., December 1930.

In the course of studies of *Frankliniella occidentalis*, Perg., on lucerne, carried out in Utah during 1928 and 1929, a mite, probably *Anystis agilis*, Banks, was observed preying upon the thrips. It occurred in lucerne flowers and to some extent on the ground beneath the plants, and its abundance in a given locality varied directly with that of the thrips, being higher during August and September when racemes were frequently found to contain 2–3 mites. Where the mite was scarce, the thrips was much more abundant than in localities where it was established. The Anthocorid, *Orius* (*Triphleps*) *insidiosus* var. *tristicolor*, White, was more numerous than the mite, preying actively upon the thrips throughout the season.

Smith (R. H.). **An additional Statement concerning the Tank-mixture Method of using Oil Spray.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 1009–1011. Geneva, N.Y., December 1930.

Further arguments are advanced in support of the recommendation of the tank-mixture method of using oil spray [*R.A.E.*, A, xviii, 481], which has aroused hostile criticism. The method is based on the fundamental tenet that in the use of an oil of given specifications as to viscosity, distillation range and sulphonation, the insecticidal efficiency and injurious effects, so far as the spray mixture is concerned, depend entirely upon the amount of oil deposited during the process of spraying; and the amount of oil deposited can be governed by placing the spreader or emulsifying material directly in the water in the spray tank, adding the spray oil and maintaining a uniform mixture by means of agitators. The stability of the emulsion or spray mixture and the size of the oil globules, factors that have hitherto been the focus of attention of all investigators and manufacturers of oil spray,

become of relatively negligible importance. The dependability of the method hinges upon proper agitation and the proper kind and amount of emulsifier, and its use is not recommended where the available spray machines are underpowered. The author believes, however, that all sprayers applying oil emulsions should meet the agitation requirements specified for the tank mixture method. The ideal spreader is one that is not subject to reactions with the salts in the spray water, and it must have the property of causing the mixture to wet in such a manner as will prevent the deposit of oil from becoming excessive. Recent studies have shown that powdered blood albumen, a proprietary preparation of which in liquid form has been in use with a proprietary emulsion in California during the past 4–5 years, is one of the most promising oil spray spreaders.

van der Meulen (P. A.). **A Note on the Relation between insecticidal Action and the physical Properties of Soap Solutions.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 1011–1012, 1 ref. Geneva, N.Y., December 1930.

In view of the striking variations in the mortality of the Japanese beetle [*Popillia japonica*, Newm.] produced by different kinds of soap as contact insecticides [*R.A.E.*, A, xviii, 69], an attempt has been made to find a correlation between certain physical properties of the soaps and their killing power. No definite relation was found to exist between the surface tension, penetration or viscosity of the soaps and their effectiveness. There was, however, a relation between mortality and the film formation that occurs when 1 per cent. solutions of various soaps are exposed to the air for 15–30 minutes on watch glasses. The soaps that form the toughest and most adherent films give the highest insect kill, those that form less tenacious and weaker films give a lower kill, and absence of film formation corresponds with absence of kill. It would be of interest to extend this study to insects other than *P. japonica*.

Back (E. A.), Cotton (R. T.) & Roark (R. C.). **Rotenone as a Moth-proofing Agent.**—*J. Econ. Ent.*, xxiii, no. 6, p. 1014. Geneva, N.Y., December 1930.

Experiments begun during June 1929 and continued to date have demonstrated that solutions containing 1–2 per cent. of rotenone dissolved in acetone, if used thoroughly to impregnate woollen goods, render them resistant to fabric pests such as *Tineola bisselliella*, Hum., *Anthrenus vorax*, Casey, and *Attagenus piceus*, Ol. Even weaker solutions, some containing only 0·05 per cent. of rotenone, gave excellent protection.

Strong (L. A.). **Report [1929–30] of the Chief of the Plant Quarantine and Control Administration.**—86 pp. Washington, D.C., U.S. Dept. Agric., 1930.

The activities of the Plant Quarantine and Control Administration for the year ending 30th June 1930 are reviewed, and a summary is given of the legislation promulgated in regard to plant quarantines and other regulations. The insect pests dealt with are the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.], the gipsy and brown-tail moths [*Porthetria dispar*, L., and *Nygmia phaeorrhoea*, Don.], the

satin moth [*Stilpnotia salicis*, L.], the European corn borer [*Pyrausta nubilalis*, Hb.], the Japanese beetle [*Popillia japonica*, Newm.], the Asiatic beetles (*Anomala orientalis*, Waterh., and *Aserica castanea*, Arr.), the pink bollworm [*Platyedra gossypiella*, Saund.], the thurberia weevil [*Anthonomus grandis thurberiae*, Pierce], the Mexican fruit worm (*Anastrepha ludens*, Lw.), the date scale [*Parlatoria blanchardi*, Targ.], and the narcissus bulb flies [*Merodon equestris*, F., and *Eumerus* spp.]. It is stated that *S. salicis* was found during the summer of 1930 at Annapolis, Nova Scotia. A co-operative project was organised in conjunction with the Mexican authorities to obtain information on the occurrence, abundance and food-plants of *P. gossypiella*, and a preliminary survey of the northern half of Mexico was made between September 1929 and March 1930. *Hibiscus cardiophyllus*, which is known to harbour the pink bollworm, was found to be generally distributed in several States, as were other malvaceous plants, only one of which, *Abutilon hypoleucum*, was found to harbour a single larva. Almost all cotton plantings in three States inspected were found to be infested.

Tests to determine how far stalks infested by *Pyrausta nubilalis* might be carried by flood water were carried out in March 1926 by throwing 320 marked units consisting of stalks or bundles of stalks into the Ohio river at numerous points. During a period of 8 weeks 10 per cent. of these were recovered, the maximum distance for an individual stalk being 222 miles. As the average distance of 44 miles is nearly double that of the average flight of the moths, parts of the maize belt are liable to initial infestation through the waterways. Examination of drift lodged along the banks of the Ohio and Miami rivers, and of trees and bushes in previously flooded areas in May and June 1930, revealed the presence of 25 larvae and pupae, 12 of which were alive. Although most of them were *P. ainsliei*, Heinr., 3 were *P. nubilalis*.

A list is given of some of the insect pests intercepted on or in foreign plants or plant products during the year under review.

Maheux (G.). **Quelques observations sur un insecte phytophage.**—*Nat. canad.*, lvii, no. 12, pp. 241–250, 4 refs. Quebec, December 1930.

A popular account is given of an outbreak of *Hemerocampa leucostigma*, S. & A., in Quebec, and of its control by Ichneumonid and Tachinid parasites.

Swaine (J. M.). **Airplane dusting Operations for the Control of defoliating Insects.**—*Rep. Civ. Aviat. Civ. Govt. Air Operations 1929*, reprint 16 pp., 1 pl., 1 map. [Ottawa] Dept. Nat. Defence, 1930.

This is a detailed account of dusting experiments conducted in 1929 against forest defoliating insects [*cf. R.A.E.*, A, xviii, 285]. In the case of the spruce budworm [*Tortrix fumiferana*, Clem.] in Ontario, the reduction in infestation through natural causes on the undusted trees from an average larval population of 3,600 to a tree to the pupal population was 66 per cent. The same reduction on the areas dusted with 40 lb. calcium arsenate to the acre was approximately 90 per cent., and the reduction in the pupal population apparently due to the action of the poison was approximately 70 per cent. The mortality of the larvae was high immediately after dusting,

and the poison continued to be effective for about two weeks. Unfavourable weather conditions and various technical difficulties delayed the work so that the dust was being applied when the larvae were nearly full grown and were consuming but little foliage. Furthermore, owing to the fact that the trees had been severely defoliated in the previous season, the sparse upper foliage was quickly destroyed, causing the larvae to descend much sooner to the lower parts of the tree, where the poison was necessarily less effective.

A survey of the area selected for dusting against the hemlock looper [*Ellopia fiscellaria*, Gn.] on spruce and balsam fir [*Abies balsamea*] in Quebec showed that the larvae were abundant only in the immediate neighbourhood of the defoliated areas, where the younger stages were found almost exclusively on the lower foliage, chiefly of young balsam and spruce. After feeding for two weeks, they migrate to the taller trees, and by the time they are two-thirds grown they are found in the tops of the trees, where feeding chiefly occurs. The dust was applied on an average at the rate of 18 lb. to the acre, and a control of 95 per cent. was obtained. Dusting should begin as soon as possible after the young larvae become abundant, since even small amounts of poison destroyed nearly 100 per cent. of the young larvae. From 10 to 15 lb. of dust to the acre is probably sufficient against the first three instars. The cost of the dusting operations, which included labour, materials and the use of an aeroplane, amounted to about £1 16*s*. to the acre.

The technique and the methods employed in the experiments are discussed. The calcium arsenate used contained approximately 40 per cent. As_2O_5. Where 30–40 lb. to the acre were used, slight scorching of the young foliage occurred, and the dust adhered more readily to the old foliage than to the needles on the growing shoots. A more adhesive mixed dust containing about 20 per cent. of As_2O_5 might be more efficient, and when doses of 10 lb. or less are required, such a dust would enable a heavier dust cloud to be used. The rate of delivery in the latter part of the experiments was approximately 100 lb. in slightly over 11 seconds, giving 350 lb. of the dust to the mile at the set speed of 90 miles an hour. A single dust cloud descending in calm air, when discharged close over the trees, covers a swath on the ground from 200 to nearly 300 ft. in width, and a narrower distance, estimated at 150 ft., in the tree tops. In order to obtain a more even distribution, the dust clouds should overlap considerably, and in calm weather the distance between the flight lines should not be greater than 150 ft. In still air the dust should be discharged from a height of about 60 ft. above the tree tops, provided that the cloud descends satisfactorily. If drifting or rising occurs, the distance above the trees should be reduced. Dusting was carried out successfully in a wind not exceeding 8–10 miles an hour on the ground. A high humidity is one of the essential conditions for successful dusting, and applying the dust when the foliage is wet with dew is recommended.

MARSTON (A. R.) & DIBBLE (C. B.). **Investigations of Corn Borer Control at Monroe, Michigan.**—*Spec. Bull. Michigan Agric. Expt. Sta.*, no. 204, 47 pp., 17 figs. East Lansing, Mich., May 1930. [Recd. 1931.]

Agricultural investigations carried out by Marston during 1926–1929 dealt with the effect on infestation by *Pyrausta nubilalis*, Hb.,

of the date of planting of maize under the conditions prevailing in Michigan ; the percentage of destruction of corn borers in the husker-shredder, ensilage cutter and roughage mill, through which maize fodder is passed ; and the crossing of strains of maize to secure a variety resistant to attack. Trap strips of early planted maize, which may be harvested early for silage, attract the moths of *P. nubilalis* and carry the heavier infestation. Although part of the reduction in infestation observed in the main body of experimental fields may have been due to the later planting regardless of the traps, there is some evidence to show that fields having trap strips carried lighter infestation than other fields in the same locality planted at the same time.

The effectiveness of clean ploughing was demonstrated in the course of investigations carried out by Dibble by the complete absence of moths in screen traps placed in fields where maize stalks had been ploughed under to a depth of 6–8 inches. A similar experiment was conducted in which a known number of larvae of *P. nubilalis* were buried in maize stalks in a furrow 8 inches deep. In the case of larvae buried in the autumn, 9·1 per cent. were recovered in corrugated paper strips laid on the surface of the ground inside the trap. In the case of material buried in the spring, 39·1 per cent. of the buried larvae were recovered. The remaining borers evidently perished, as no moths were taken and no borers were found when the buried material was exhumed and inspected. Some borers buried at depths of 4, 6, 8, 12 and 16 inches were, however, recovered in corrugated paper strips placed on the soil surface. Studies of egg deposition in the field indicated that the moths tend to lay their eggs on the larger and more advanced plants ; in experiments plants ranging from 24 to 36 inches in height were preferred to larger or smaller ones. Emergence of moths from maize stored in open cribs followed that of field collected material very closely, maximum emergence from the crib occurring about 10 days after the maximum general moth flight. In a field in which the maize stubbles averaged 9 inches in height, 9·2 per cent. of the borer population before harvest was found in the stubble and 0·4 per cent. of the total population occurred below the ground.

Comparative experiments indicated that *P. nubilalis* under Michigan conditions preferred maize to common mugwort (*Artemisia vulgaris*) for oviposition [*R.A.E.*, A, xvii, 220].

Many farmers report somewhat severe losses in 1929, when the most heavily infested field carried 99·9 per cent. infestation with an average population of 11 borers to a plant.

REED (C. O.), GRAY (R. B.), WORTHLEY (L. H.) & CAFFREY (D. J.). **Fighting the Corn Borer with Machinery in the Two-generation Area.**—*Circ. U.S. Dept. Agric.*, no. 132, 50 pp., 36 figs., 1 ref. Washington, D.C., August 1930.

The areas in the United States in which the corn borer [*Pyrausta nubilalis*, Hb.] has two generations a year are, generally speaking, those east of the Connecticut river in New England. The control methods described are directed against the overwintering larvae, which occur from about 15th September until 1st May. They consist of the treatment of the infested material in such a manner that hibernating larvae are destroyed or the plants are rendered unfit to furnish further protection for them. Tools and machinery of various kinds for the

treatment and ploughing under of the infested material are described, and detailed instructions are given for the use of different ploughs in the field.

McDaniel (E. I.). **European Pine Shoot Moth found in Michigan.**—*Quart. Bull. Michigan Agric. Expt. Sta.*, xiii, no. 2, pp. 69–71, 2 figs., 2 refs. East Lansing, Mich., November 1930.

Rhyacionia buoliana, Schiff., an important pest of young pine trees and nursery stock, was found infesting Scots pine [*Pinus sylvestris*] in two localities in Michigan during the summer of 1930. This is probably the first record of its occurrence in the State. Its bionomics and introduction into the United States in 1914 are discussed [*R.A.E.*, A, ii, 701 ; iii, 376, etc.]. There is one generation a year ; pupation takes place in mid-May in a hollowed-out shoot, and the adults emerge about three weeks later. Cutting off and burning the infested twigs between late autumn and mid-May is considered the most effective control measure, and as the larvae have sometimes been observed to feed externally, keeping the new growth covered with lead arsenate from the time it appears until the end of May may also be of value.

Snyder (T. E.). **Preventing Damage by Termites or White Ants.**—*Fmrs.' Bull. U.S. Dept. Agric.*, no. 1472, revd., 22 pp., 19 figs. Washington, D.C., June 1930.

This revised bulletin [*cf. R.A.E.*, A, v, 147 ; vii, 520] reviews modern methods of dealing with the problem of damage by termites, especially with regard to the construction of buildings.

Edwards (W. H.). **A destructive Pest of cruciferous Crops. The Small Green Cabbage Worm**—*Plutella cruciferarum* **Zell.**—*J. Jamaica Agric. Soc.*, xxxiv, no. 11, pp. 582–583. Kingston, November 1930.

Notes are given on the bionomics and control of *Plutella maculipennis*, Curt. (*cruciferarum*, Zell.), which was first recorded in Jamaica at the end of 1929, when it caused serious injury to cabbages in one locality. It continued to breed throughout the year at lower altitudes on the Island, where observations were carried out, being more abundant, however, during the winter months.

Clark (A. F.). *Paropsis dilatata* **Er. in New Zealand. Preliminary Account.**—*N.Z. J. Sci. Tech.*, xii, no. 2, pp. 114–123, 8 figs., 3 refs. Wellington, N.Z., October 1930.

The introduction of many species of *Eucalyptus* into New Zealand took place soon after organised attempts at settlement had succeeded, and the importance of these trees, which are now present in practically every part of the Dominion, is steadily increasing with the diminution of the indigenous forests. In order to ascertain the exact status of the various insects attacking *Eucalyptus*, a survey of the stands was begun in 1928. This revealed the large amount of damage done by the Chrysomelid, *Paropsis dilatata*, Er. In all 3,800 acres were surveyed by the sample-plot method, and the percentages of infested trees

found were 0–25 over 120 acres, 26–50 over 980, 51–75 over 650, and 76–100 over 2,050. All stages of the insect are briefly described.

The adults feed on the edges of the leaf, causing wide and deep notchings. When disturbed they fall to the ground. Flight is strong and takes place during the heat of the day. The eggs are laid on the surface of the leaf in the shade, in groups of 12–24. The larvae also feed on the edges of the leaves, making very deep indentations. When mature, they drop to the ground and pupate at a depth of 1–2 ins. beneath the surface. The adult passes the winter under the bark of the trees, and emerging in September, begins to feed. Eggs, which are first laid in October, hatch in 7–10 days. The larval stage lasts 18–25, the pre-pupal 8–10, and the pupal 12–14. There are at least two generations a year, and, as a considerable amount of overlapping occurs, most stages of the beetles can be found until April. Hibernation depends largely upon weather conditions, but generally begins in May or June. A list is given of the species of *Eucalyptus* attacked. The infestation is at present confined to the eastern part of the South Island and is most intense in the Province of Canterbury. The distribution of food-plants is the most important factor affecting that of the beetle, and whereas small stands occur regularly throughout Canterbury, there is a distinct break towards the northern and western boundaries of the Province. The mountains to the north and west also retard its spread in these directions. In stands originally containing both conifers and *Eucalyptus* that have been cut down and re-planted with conifers alone, the beetles breed profusely in the undergrowth produced by the *Eucalyptus* stumps during the years before the conifers overtake and suppress it. They show a tendency at spread in the direction of the prevailing winds and may also be carried by vehicles.

VEITCH (R.). **Reports of the Chief Entomologist.**—*Ann. Rep. Dept. Agric. Queensland 1928–29*, pp. 67–71 ; *1929–30*, pp. 65–66. Brisbane, 1929–30. [Recd. 1931.]

The activities of the Division of Entomology for the years 1928–30 are reviewed in these two reports. The Histerid, *Plaesius javanus*, Er., and the Leptid, *Chrysopilus ferruginosus*, Wied., were introduced from Java and liberated against the banana weevil [*Cosmopolites sordidus*, Germ.] in December 1928 [*R.A.E.*, A, xvii, 243]. Inspection six months later showed *P. javanus* to be present in all stages, so that this predator is likely to become permanently established, but no trace was found of *C. ferruginosus*, which had been imported in the larval stage and experienced a high degree of mortality in transit, so that few adults survived for liberation. Rust of bananas due to *Scirtothrips* (*Anaphothrips*) *signipennis*, Bagn., was very abundant, but other pests of bananas [xvi, 223] were of relatively slight importance.

Infestation of deciduous fruits by *Dacus ferrugineus*, F. (*Chaetodacus tryoni*, Frogg.) was not serious, but losses due to *Cydia pomonella*, L., were more extensive in 1928–29 than at any time during the previous seven years. Further colonies of *Trichogramma minutum*, Riley, were liberated, but little was seen of it in the following season. Although this parasite had attacked the eggs of *Plutella maculipennis*, Curt. (*cruciferarum*, Zell.) readily in captivity, all efforts to find it in heavily

infested cabbage fields in which it had been liberated were unsuccessful. *Aphelinus mali*, Hald., continues to be an effective check on the woolly apple aphis [*Eriosoma lanigerum*, Hausm.]. Potatoes were badly infested by *Phthorimaea operculella*, Zell., in a district from which this moth had not previously been recorded. *Orgyia anartoides*, Wlk., which was responsible for extensive skeletonising of foliage on small isolated groups of apple trees in 1928–29 and some injury to fruit, was easily controlled by arsenical treatments. Pests of *Citrus* under investigation are the Pentatomids, *Biprorulus bibax*, Bredd. (spiny orange bug) and *Oncoscelis sulciventris*, Stål (bronze orange bug), the Coreid, *Leptoglossus bidentatus*, Montr., *Decilaus citriperda*, Tryon (root bark channeller), *Chrysomphalus aurantii*, Mask., and *Ceroplastes rubens*, Mask. Work on cotton pests during the past two years has concerned *Euxoa radians*, Guen. (brown cutworm) and *Dysdercus cingulatus*, F. (*sidae*, Montr.). *Heliothis obsoleta*, F., was extremely destructive to cotton in certain districts in 1929–30; and Lamellicorn larvae and *Oncopera mitocera*, Turner, caused much damage to pastures.

VAN DER GOOT (P.). **Pests of the Rice Crop round the Pacific. I. Introduction. The more important Pests of the Rice Crop in the Dutch East Indies.**—*Proc. 4th Pac. Sci. Cong. Java 1929*, iv, Agric. Papers, pp. 1–7. Batavia, 1930.

The most important pest of rice in Java is *Scirpophaga innotata*, Wlk., which is very injurious in the dry districts of the lowlands. For upland or dry land rice the only pests of any importance are *Lachnosterna* (*Holotrichia*) *helleri*, Br., *Exopholis hypoleuca*, Wied., and *Anomala* (*Euchlora*) *viridis*, F., all of which as larvae attack the young plants, and *Atherigona exigua*, Stein, which attacks only young dry-grown rice, doing most damage in districts with a heavy rainfall and in fields planted rather late in the season.

As regards control, chief attention is being paid to the biology of the insects in connection with the plant. In the case of *S. innotata*, late sowing is advised, at least 6 weeks after the first shower, in order that all moths may have emerged from the stubble so that such sowings may remain free from borers. Where late sowing cannot be enforced, the growers should be advised as to the correct date for transplanting the different varieties, to prevent the pre-flowering period coinciding with the emergence of the fourth generation of moths. The emergence is determined by light-traps, and where enforced late sowing is in practice, no sowing is permitted until emergence is on the decline. The customary time of sowing is not delayed for more than 2–3 weeks, and observations over four years have shown that if this system is properly carried out no serious damage occurs.

The eggs of *Chilo simplex*, Butl., are so heavily parasitised in Java by *Trichogramma australicum*, Gir., and *T. minutum*, Riley, that it is kept in check. When *Leptocorisa acuta*, Thnb., occurs in small numbers, the damage is of no importance, but when in large swarms there is continual reinfestation from outlying fields, and it is therefore advised that the transplanting in adjacent districts should be completed within 2–3 months. The control of leaf-eating larvae and of leaf-hoppers is maintained by broadcasting kerosene mixed with sawdust over the rice-fields to form a film on the water.

Corbett (G. H.). **Brief Notes on some Padi Insects in Malaya.**—*Proc. 4th Pac. Sci. Cong. Java 1929*, iv, Agric. Papers, pp. 133–135. Batavia, 1930.

Much of the information in this review of rice pests in Malaya has already been noticed [*R.A.E.*, A, xviii, 557, 593, 655]. *Leptocorisa acuta*, Thnb., migrates from various grasses when the rice flowers. On small groups of plants just bursting into bloom in the middle of large areas of younger rice the bug collects in numbers and should, therefore, be collected and destroyed. Planting as traps small areas of rice about a month before the main crop or a quick-maturing variety is suggested. Minor pests include *Nephotettix bipunctatus*, F., *Melanitis ismene*, Cram., *Parnara* (*Baoris*) *mathias*, F., *P.* (*B.*) *bada*, Moore, *Nymphula depunctalis*, Gn., and *Spodoptera mauritia*, Boisd. The species of *Parnara* are heavily parasitised and normally controlled by Tachinids of the genus *Halidaya* and Braconids, and occasionally by Chalcids and an Ichneumonid. *S. mauritia* is attacked by Tachinids, including *Cyphocera varia*, F., and by an Ichneumonid.

Willard (H. F.). **Three Insect Pests and their Parasites in Hawaii.**—*Proc. 4th Pac. Sci. Cong. Java 1929*, iv, Agric. Papers, pp. 137–138. Batavia, 1930.

Notes are given on the parasites of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., in Hawaii [*R.A.E.*, A, xvi, 226] and on the biological control of *Ceratitis capitata*, Wied. [*cf.* xvi, 109, etc.]. *Dacus* (*Chaetodacus*) *cucurbitae*, Coq., attacks cucurbits, tomatos and green beans. *O. fletcheri*, Silv., introduced from India in 1916, has decreased its numbers, but does not control it.

Matsumura (S.). **On some injurious Insects of the Sugar-cane in Formosa.**—*Proc. 4th Pac. Sci. Cong. Java 1929*, iv, Agric. Papers, pp. 139–142. Batavia, 1930.

Notes are given on a few of the pests of sugar-cane in Formosa [*cf. R.A.E.*, A, xvi, 418, 481] ; minor pests include *Rhabdocnemis* (*Sphenophorus*) *obscura*, Boisd., and *Perkinsiella saccharicida*, Kirk. The wounds made by *Aphis maidis*, Fitch (*adusta*, Zehnt.) may become the point of infection by yellow-stripe disease. *Chilo infuscatellus*, Sn., is much less numerous than formerly ; its eggs may be used in the laboratory as hosts for *Phanurus beneficiens*, Zehnt., when those of *Diatraea venosata*, Wlk., against which this parasite was introduced, are not available.

Snyder (T. E.). **The Termite Problem in the Pacific Area.**—*Proc. 4th Pac. Sci. Cong. Java 1929*, iv, Agric. Papers, pp. 143–156, 12 pls., 13 refs. Batavia, 1930.

In the Pan-Pacific region there are nearly 1,000 different termites, but by following proper methods [*cf. R.A.E.*, A, xvii, 730 ; xix, 120, etc.] in the construction of buildings and in the cultivation of plants, together with the use of poisons, damage by these insects can be controlled. To destroy termites in the woodwork of buildings and boats, fumigation with hydrocyanic acid gas just before the insects

are ready to fly is successful, using 12 oz. sodium cyanide to 18 fluid oz. sulphuric acid and 36 fluid oz. water per 1,000 cu. ft. room capacity. Furniture can be treated in steel cylinders with carbon bisulphide gas or, more effectively, by exposure to 130° F. or over for at least $1\frac{1}{2}$ hours. Dry Paris green blown into the galleries of termites in wood, whether living or not, has been successful, though the powder cakes if moisture is present, and several applications may be necessary. In districts where dry-wood termites cause much damage, all woodwork used in buildings must be impregnated with a preservative or be completely insulated from the ground. If subterranean termites are numerous in soil on which buildings are to be constructed, it should be deeply ploughed, treated with a suitable poison, or with steam, or be temporarily flooded. For living trees clean culture is the best preservative. To prevent injury to sugar-cane from subterranean termites, the seed-cane for planting should be dipped in kerosene, creolin, or a 10 per cent. solution of sodium arsenite.

Buildings and a tower of redwood (*Sequoia sempervirens*) erected on Barro Colorado Island in 1927 showed no penetration of the wood by termites a year later, but the scarcity of such termite-resistant woods renders necessary the use of impregnated commercial timbers.

KUWANA (S.). **Important Insect Pests of the Rice Crop in Japan.**—*Proc. 4th Pac. Sci. Cong. Java 1929*, iv, Agric. Papers, pp. 209–216. Batavia, 1930.

An account is given of the distribution in Japan and bionomics, natural enemies and control of *Chilo simplex*, Butl., *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.), *Sesamia* (*Nonagria*) *inferens*, Wlk., *Parnara guttata*, Brem., *Delphacodes* (*Liburnia*) *striatella*, Fall., *D.* (*L.*) *oryzae*, Mats., *Sogata* (*L.*) *furcifera*, Horv., *Nephotettix apicalis* var. *cincticeps*, Uhl., *Deltocephala dorsalis*, Motsch., and *Scotinophara* (*Podops*) *lurida*, Burm., together with a list of eleven less important pests of rice, and a note stating that *Chilo infuscatellus*, Sn., and *Diatrea venosata*, Wlk. (*striatalis*, Sn.) are found on sugar-cane, in Taiwan only.

LEEFMANS (S.). **Coöperation in Parasite Work around the Pacific.**—*Proc. 4th Pac. Sci. Cong. Java 1929*, iv, Agric. Papers, pp. 217–222. Batavia, 1930.

In work on the biological control of insect pests efficient international co-operation would be of great value. Useful aids to such co-operation would be the registration of parasites and predators of the countries round the Pacific, publication of particulars of methods of sending such insects from one country to another, better organisation of the systematic side of parasite work, and, if possible, the creation of an international institution for a systematic knowledge of the parasitic Hymenoptera and Diptera of the world, to ensure reasonably quick identification of parasites.

DU PASQUIER (R.). **Recherches sur les Hyménoptères parasites du "Borer"** (*Xylotrechus quadripes* **Chev.**).—*Proc. 4th Pac. Sci. Cong. Java 1929*, iv, Agric. Papers, pp. 519–524, 4 pls. Batavia, 1930.

The Hymenopterous parasites in Indo-China of possible use against the coffee borer, *Xylotrechus quadripes*, Chevr., are *Sclerodermus*

domesticus, Latr., *Doryctes strioliger*, Kieff., *D. picticeps*, Kieff., *D. tristriatus*, Kieff., *Pristaulacus nigripes* var. *duporti*, Kieff., and an unidentified Chalcid. All of these, except *P. nigripes duporti*, also parasitise the bamboo borer, *Chlorophorus annularis*, F. It has been possible to breed only the first two in sufficient numbers for use in control. *S. domesticus* is the more robust and prolific and breeds in the stem of the plant, ovipositing on the larvae, pupae and adults of the host. The adult may live several months, and the minimum length of the life-cycle is two months. *D. strioliger* is easily bred in the laboratory, but is less robust in the field. The adult life is short, the complete life-cycle lasting 25 days in summer and 2½ months in winter. Oviposition takes place through the bark, and only larvae near the surface are reached. In the laboratory both parasites are equally easily bred on the coffee and bamboo borers, April and May being the best time of year. Though liberating these parasites in the field gives a certain amount of control, success is only attained by the continued liberation of large numbers. In the author's opinion, therefore, breeding indigenous parasites will not be of much avail, and attempts should be made to find suitable foreign ones.

Uichanco (L. B.). **A Summary of Insects affecting Rice in the Philippines.**—*Proc. 4th Pac. Sci. Cong. Java 1929*, iv, Agric. Papers, pp. 569–582, 12 refs. Batavia, 1930.

In this paper 65 species of rice pests are dealt with, none of which is considered endemic in the Philippines. Examples are given of direct and indirect reactions of pests of rice to changes in environmental factors. The question of immune or resistant varieties of rice requires further study. Most of the insects attack the plants in definite stages of growth only, and an analysis is given of the causes of these selective responses to changing condition of the food-plant. Forty species of natural enemies, which play an important part in control, are listed. Only a limited amount of work has been done on the introduction of enemies from other countries.

Fullaway (D. T.). **Parasites of Pests of Field-crops, Vegetables and Citrus.**—*Proc. 4th Pac. Sci. Cong. Java 1929*, iv, Agric. Papers, pp. 593–594. Batavia, 1930.

A list is given of 25 insect pests in Hawaii, with particulars of their insect enemies.

[Rakhmaninov (A. N.) & Yaroslavtzev (G. M.).] **Рахманинов (А. Н.) и Ярославцев (Г. М.). Programme for the Observation Points on Pests of Field Crops.** [*In Russian.*]—*Lenin Acad. Agric. Sci., Bur. Appl. Ent. Zool.*, [*Pub.*] no. 14, 84 pp., 3 figs. Leningrad, 1930. Price 80 *kop.*, Binding 40 *kop.*

This manual is intended for the entomological observation stations of the Service for the Estimation of Pests in the Russian Union. Instructions are given for carrying out observations on the injury caused to various field crops by pests and on the bionomics of *Euxoa* (*Agrotis*) *segetum*, Schiff., *Phytometra gamma*, L., *Loxostege sticticalis*, L., *Mayetiola destructor*, Say, *Anisoplia* spp., and Tipulids. Samples of questionnaires, and a list of books for the use of the stations are appended.

[SAKHAROV (N.).] **Сахаров (Н.). Insects taking Part in the Formation of Caoutchouc on** *Chondrilla ambigua* **Fisch.** [*In Russian.*]—*Zh. opuitn. Agron. Yu.-Vostoka*, viii, no. 2, pp. 367–372, 14 figs. Saratov, 1930. (With a Summary in English.)

In view of the special attention that is now being paid in Russia to various rubber-producing plants growing wild in the Lower Volga region and other parts of the country, laboratory observations were carried out in Saratov in the winter of 1929 on the process of the exudation of latex from *Chondrilla ambigua*. It was found that the stems of the plants are infested by the Buprestid, *Sphenoptera foveola*, Gebl., the Pyralid, *Bradyrrhoa gilveolella*, Tr., and the Mordellid, *Mordellistena micans*, Germ., and that the larvae of the first two are responsible for the exudation of latex, whereas those of *M. micans* feed exclusively on the core of the stems and are of no value in this connection.

In the steppes of the Astrakhan region the adults of *Sphenoptera* are on the wing in June, and the life-cycle is probably completed in four years, of which three are passed in the larval stage. Eggs are deposited in small pits on the stems of *Chondrilla* at a height of about 6–8 ins. from the soil, and are protected by a cover of latex. The young larvae feed on the bast and wood, causing the exudation of latex, which hardens in lumps on the surface of the plants; in the second and third years the larvae also feed deeper in the stems, the exudation of the latex continuing all the time. In the fourth year the weight of individual pieces of latex may be as much as 2½ oz. The larvae that feed on thin stems live in a cavity made in the latex lumps, and such pieces are considerably lighter. Pupation occurs in the summer in chambers made in the latex.

Very little has been observed of the bionomics of *Bradyrrhoa*. The larvae live on the surface of the stems, feeding on the bast and cambium; they are protected by cases made of the frass, impregnated with latex and lined with silk. These are gradually formed as they ascend the stems, and weigh up to 23 grains each, pupation taking place in them. The rubber contained is of higher quality than that produced by the feeding of *S. foveola*. Some of the larvae of *Bradyrrhoa* are parasitised by the Ichneumonid, *Syzeuctus maculatorius*, F.

[ISACHENKO (V. B.) & BONDARTZEV (A. S.).] **Исаченко (В. Б.) и Бондарцев (А. С.). Cyancalcium als Mittel zur Bekämpfung der Schildläuse und Blasenfüsse in Treibhäusern.** [Calcium Cyanide as a Means of controlling Coccids and Thrips in Greenhouses. (*In Russian.*)]—*Morbi Plantarum*, xviii, no. 4, pp. 177–187, 7 refs. Leningrad, 1929. (With a Summary in German.) [Recd. 1930.]

An account is given of a large number of experiments carried out in Leningrad in the spring of 1929 to test the effect of calcium cyanide "A dust" for fumigating 150 varieties of ornamental greenhouse plants. They were treated in a small fumigation chamber with 80–90 per cent. humidity and at temperatures fluctuating between 13 and 25° C. [55·4–77° F.], the exposure lasting 24 hours and usually beginning at 5 p.m. The detailed results are given in tables. Aphids and thrips were controlled by ¼ oz. calcium cyanide to 1,000 cu. ft. and Coccids by 1 oz., no injury being caused to the plants, though fumigation at this rate was not effective against *Tetranychus*.

Monastero (S.). **Il** *Ficus carica* **L. infestato dal** *Cossus cossus* **L.**—*Bull. Ist. zool. Palermo*, ii, no. 2–3, pp. 41–44. Palermo, 1st June 1930.

Cossus cossus, L., is recorded for the first time as boring in fig trees in Sicily, where it apparently prefers fig to apple or other trees.

Poutiers (R.). **Influence de certains facteurs sur la nymphose des larves de** *Ceratitis capitata* **(Diptère Trypet.).**—*C.R. Soc. Biol.*, cv, no. 34, pp. 709–710, 1 ref. Paris, 12th December 1930.

Experiments with the mature larvae of *Ceratitis capitata*, Wied., in which they were placed when about to pupate on various types of soil, indicate that their habit of jumping is definitely associated with an attempt to find a suitable medium for pupation. This faculty is not made use of when the larvae find themselves on light and moist soil, but comes into play when they are placed on hard or dry soil.

Hubault (E.). **Invasions de macrolépidoptères dans l'Est de la France. Microorganismes parasites des insectes.**—*Proc. int. Cong. Forestry Expt. Stas., Stockholm 1929*, pp. 631–642, 4 figs., 11 refs. Stockholm, 1930.

An account is given of the infestation of beech forests in Lorraine by *Dasychira pudibunda*, L., which was checked in 1927 by a bacillus, a study of which was made [*R.A.E.*, A, xvi, 340], and of an outbreak of *Bupalus piniarius*, L., on pines and of dusting against it by means of aeroplanes [xvi, 428].

Suire (J.). **L'acariose de l'abeille.**—*Ann. École nat. Agric. Montpellier*, xx, fasc. 3, pp. 204–212, 4 figs. Montpellier [1930].

In view of numerous cases of infection of bees by *Acarapis woodi*, Rennie, in the Montpellier region, the author gives an account of the mite and the nature of the infection. Humidity seems favourable to the development of this mite. The author considers that the bee is most liable to infection on the twelfth day after emergence and not the ninth day as has been previously supposed [but *cf. R.A.E.*, A, xix, 180]. Though workers and queens are also attacked, the drones are particularly susceptible. The best methods of dealing with acarine disease are prophylaxis and the prompt destruction of centres of infection, and where these measures have been enforced by legislation, its incidence has been considerably reduced. A very important point is to keep infected crawling bees from spreading the disease to healthy colonies; the latter can be protected by vessels of water or by rings of a sticky substance placed round the hives to isolate them. The entrance to infected hives should be made smaller in order to prevent healthy robber bees from entering and carrying infection back to their colony. As it is thought that the mites are attracted to the spiracles of bees by a special odour, attempts have been made to counteract this by the evaporation of other substances [*cf. R.A.E.*, A, xv, 486]. Very successful results have been obtained in France with methyl salicylate applied by means of a Bonamy evaporator of 100 cc. capacity, with the wick protruding for from about ½ to 1 in., according to the capacity of the hive. The

evaporator is fitted into a section near a corner of the colony; it ensures great regularity in evaporation, and the methyl salicylate contained in it only requires renewal every eight weeks in winter and every two to four weeks in summer. For the majority of hives, comprising about ten frames, one evaporator to each colony is enough; two throughout the summer would be injurious.

Neuwirth (F.). **Zprávy Výzkumného ústavu čsl. průmyslu cukrovarnického v Praze. DLXXVIII. Zelené mšice na řepě.** [Reports of the Experiment Institution of the Sugar Industry in Prague. DLXXVIII. Green Aphids on Beet.]—*Listů Cukrovarnických*, xlviii, no. 20, pp. 222–224, 2 figs. Prague, 1930.

Rhopalosiphum sp. was numerous on seedlings of sugar-beet near Prague in June 1929, this being the first record for the district of the occurrence in the field of green Aphids on this plant, which is usually attacked in Czechoslovakia by *Aphis fabae*, Scop. The Aphids occurred on the lower surface of the leaves, causing them to curl. In the greenhouse their reproduction ceased at 32–38° C. [89·6–100·4° F.] and 65–70 per cent. relative humidity, but was resumed at lower temperatures and 70–90 per cent. humidity. When the Aphids were reared on dying plants, many alate forms were produced. Besides the usual measures for Aphid control, a decoction of horse chestnuts proved effective as an insecticide.

Brooks (C. C.). **Some Forest Pests in Bilberry Areas.**—*Forestry*, iv, no. 2, pp. 104–112, 1 pl. London, December 1930.

An investigation of bilberry areas on the Welsh border, where the ecological equilibrium had been disturbed by the enclosure for plantation of ground formerly grazed over by sheep, resulting in serious injury to young conifers, owing to a sudden increase in the insect population, showed the presence of 5 species of Lepidopterous larvae, of which only *Tortrix viburniana*, F., and the Geometrid, *Eupithecia nanata*, Hb., the adults and larvae of which are briefly described, were present in sufficient numbers to be of economic importance.

Bilberry (*Vaccinium myrtilus*) appears to be the natural food-plant of *T. viburniana*. The moths were first seen in 1929 on 11th June, and they are probably present until the middle of August. They are chiefly active at sunset. The larvae feed in summer and autumn on the lower surfaces of the leaves, which they spin together with silken threads. The characters of these shelters on bilberry and young conifers are described. The larvae hibernate in cocoons among leaves, etc., on or under the food-plants and resume feeding in April, when they eat whole leaves of conifers and may even deform the shoots. Pupation takes place at the beginning of June in the shelter last inhabited by the larva, the pupal period lasting 13–17 days.

Eupithecia nanata is recorded for the first time as a pest. As the investigation was not begun until the middle of June 1929, when the larvae had already reached an advanced stage, no observations on the adults or eggs could be made. The last larva recorded pupated on 18th July. When young, the larvae feed like *T. viburniana* between leaves which they bind together in a similar manner, but when more mature, they emerge and feed exposed on the shoots. They may cause rapid defoliation of bilberry or young forest trees, but appear

to be more specific to bilberry than is *T. viburniana.* Pupation takes place early in August among the roots in the peaty soil, the adult emerging in the following spring.

Direct observation has shown that though outbreaks of these larvae begin after the bilberry patches cease to be grazed by sheep, they do not last more than 1–3 years. During outbreaks, a considerable percentage of the larvae of both species are parasitised, but there was evidence that parasites are not primarily the cause of the great diminution observed. Birds are considered of more importance, particularly in the case of *E. nanata* when feeding unprotected on the shoots. One of the most important secondary controlling factors is probably the change that occurs in the humus immediately under the vegetation, which becomes deeper, denser, more acid and continuously moist in enclosed areas, and may thus encourage epidemics of disease.

Mechanical control measures, a number of which have been tried without effect, are discussed, and it is concluded that the planting of better quality transplants in the bilberry areas is the only practicable measure. These will suffer a shorter period of post-planting check and be able to recover more rapidly from any injury they receive. Larch, being deciduous, is better able to withstand defoliation than other conifers.

DE OLIVEIRA (A.). **Parasitas da copra.**—*Bol. agríc.-pecuário,* 1930, no. 1–2, pp. 51–54, 1 pl., 3 refs. Lourenço Marques, 1930.

The morphology and biology of *Necrobia rufipes*, DeG., and *Silvanus surinamensis*, L., which are serious pests of stored copra in Mozambique, are described from the literature.

ANDERSON (T. J.). **Annual Report of the Senior Entomologist, 1929.**—*Ann. Rep. Dept. Agric. Kenya 1929,* pp. 433–463. Nairobi, 1930.

Work on the coffee mealybugs is described by H. C. James. *Pseudococcus lilacinus*, Ckll., is the most important pest of coffee in Kenya, but is difficult to distinguish from *P. comstocki*, Kuw., which may therefore be more common than is generally supposed. In one plantation, *Icerya nigroareolata*, Newst., produced a light but rather widespread infestation. It was attended, apparently exclusively, by *Acantholepis capensis*, Mayr, an ant that does not appear to be capable of supporting such intensive infestations of *P. lilacinus* as do *Pheidole* spp. The principles of banding against ants are discussed. During the quiescent period of *P. lilacinus*, which usually coincides with the colder season of the year, and with the absence of young growth, especially flowers and young berries, numerous foci of infestation may be destroyed by judicious pruning. When many mealybugs are sheltering in the old bark below the bands, an application of limewash will reduce their numbers. It is found that manured trees recover more rapidly once the ants are controlled than those in soils that contain less organic matter. Certain difficulties are presented by the use of green manure plants, as some of them harbour the mealybug ; an alternative method of manuring known as " ground thatching " is described. The factors influencing the biological control of *P. lilacinus* are discussed, and notes on the predators [*R.A.E.*,

A, xv, 566] are given. Observations in another district on ants fostering *P. lilacinus* and some preliminary spraying experiments against it are briefly discussed by R. H. Le Pelley.

New insectaries, which are briefly described, have been constructed for the rearing of mealybugs on potato sprouts [*cf.* xviii, 569] on which to breed predators. The development of *Chilocorus angolensis*, Crotch, in the laboratories was slow, but *Cryptolaemus montrouzieri*, Muls., which was imported from South Africa, has multiplied rapidly.

Notes are given on the results of a survey of insects boring in coffee berries [xviii, 337], of which the most important, *Sophronica ventralis*, Auriv., will continue to reproduce for several generations in dry coffee in stores, and on other pests of coffee, including *Anthores leuconotus*, Pasc. (white borer), *Dirphya princeps*, Jord. (yellow-headed borer) and *Apate monacha*, F. (black borer), which infest the stems, and *Antestia lineaticollis*, Stål.

H. Wilkinson reports that evidence indicates that little damage is caused by cutworms to maize when the seed is planted within about three weeks after the advent of the long rains.

Beckley (V. A.). **The Kenya Coal Tar Ant Repellent, Kresotow.**—*Bull. Dept. Agric. Kenya*, no. 7 (1930), 8 pp. Nairobi, 1930.

Kresotow is the most effective repellent against the ant [*Pheidole punctulata*, Mayr] that fosters the coffee mealybug [*Pseudococcus lilacinus*, Ckll.] in Kenya [*cf. R.A.E.*, A, xvi, 310; xviii, 566], but as consignments supplied by the manufacturers did not comply with the specification, the Department of Agriculture has been forced to take over its importation and supply. It was also found necessary to enlarge the terms of the specification. The repellent is usually applied by planters on bands of grease-proof paper over cotton-wool, and the bands are tied tightly with string to prevent the ants passing underneath. In some cases the material penetrates the paper and injures the bark. No paper could be found that is not penetrable by this substance, as minute cracks are formed by the string in tying, but it was discovered that cellophane, even if tied very tightly, will give practically complete protection to the trees. Experimentally, no penetration occurred with it even through the thinnest and cheapest quality. The usual method of banding may be followed provided that there is a fair overlap of the cellophane strip. The cost, which is discussed, would be only a little higher than that of grease-proof paper.

Lespes (—), Regnier (—) & Rungs (—). **Contribution à l'étude des phases chez le criquet pèlerin** (*Schistocerca gregaria* **Forsk.**).—*C.R. Acad. Sci. Fr.*, cxci, pp. 874–875. Paris, 1930.

Individuals of the solitary and transitory phases were very numerous in the swarms of *Schistocerca gregaria*, Forsk., which invaded Morocco in 1927. In 1928 the swarms consisted almost entirely of the transitory and gregarious phases, and their progeny which reached the adult stage in the Great Atlas Mountains in the summer of 1929 belonged to the almost typical gregarious phase. The very numerous and exceptionally large swarms which appeared between October 1929 and April 1930 consisted of typical ph. *gregaria*. Thus there exists

in this species a correlation between the maximum development of an invasion and the percentage of the gregarious phase in the swarms.

An account of some observations on transition from one phase into the other, both under natural and laboratory conditions, and certain characters distinguishing the solitary hoppers are given.

Ullyett (G. C.). **The Life-history, Bionomics and Control of Cotton Stainers** (*Dysdercus* **spp.) in South Africa.**—*Sci. Bull. Dept. Agric. S. Afr.*, no. 94, pp. 3–9, 3 refs. Pretoria, 1930.

Cotton in South Africa is attacked by *Dysdercus fasciatus*, Sign., *D. nigrofasciatus*, Stål, and *D. superstitiosus*, F. (given in order of relative abundance). Owing to their wide distribution and prevalence, they are the most important insects associated with the transmission of internal boll rot. Investigations on the life-cycle and habits of *D. nigrofasciatus* were carried out during two seasons ; it seems probable that the life-cycle of the other species is similar. Eggs are laid in the soil, usually close to the base of a plant. The incubation period varies with the climatic conditions, the average ranging from 7 days in December to 12 in April. The optimum soil temperature appears to lie between 75 and 80° F. The first instar is completed below the surface of the soil ; in the second, the nymphs come above ground and begin to feed on the softer tissues of the plant. During the third instar, they are more generally dispersed over the field, but it is not until the fifth that the proboscis is sufficiently developed to pierce through the green bolls to the lint. The nymphal period lasts from 29–57 days. Pairing first takes place 2–6 days after emergence, pairs only separating thereafter to allow of oviposition. The females laid an average of 900 eggs in 8 batches, though a maximum of 1,354 eggs in 12 batches has been obtained. The first eggs are deposited 7–16 days after the last moult. Both sexes exhibit strong powers of flight. In warm weather the life-cycle lasts about 47 days and in cold weather may extend to 83, there being probably about 5 generations annually. During very cold weather the bugs may seek shelter in buildings, such as ginneries, where cotton seed is left, but during the usually mild winter it is possible for them to feed and breed in the field. Two forms of *D. nigrofasciatus* commonly occur ; a small, pale form is found during the winter months and persists until February or early March, when a larger, slightly darker form occurs and migrates from the wild food-plants to cotton, on which it again gives rise to the small form.

The alternative food-plants include *Pappea fulva* and species of *Sterculia*, *Hibiscus*, *Datura*, *Abutilon*, and *Sida*. The bugs have also been recorded as feeding on *Citrus* fruits and may be able to exist on various succulent weeds, although it is doubtful whether breeding can take place under such conditions. The Reduviid, *Rhinocoris segmentarius*, Germ., has been observed to attack *Dysdercus*, but no parasites have been found.

Internal boll diseases cannot be transmitted until the insect reaches the fifth instar, but as the adults may live for 39–86 days, it is possible for a single individual to inoculate a large number of bolls, and it has been noticed that a very small infestation by *Dysdercus* may be accompanied by a severe outbreak of boll rot. As the stainers appear only from late February or early March, the earlier maturing bolls are unaffected. At present there appears to be no satisfactory method of

control. The production of an early crop that will escape the maximum infestation is not always possible, as it depends on the advent of suitable planting rains. Where ratooning is practised, cotton-seed traps may be used to destroy the stainers overwintering in the ratoon crop.

MOORE (E. S.). **Internal Boll Disease of Cotton in South Africa.**—*Sci. Bull. Dept. Agric. S. Afr.*, no. 94, pp. 11–18, 20 refs. Pretoria, 1930.

The problem of boll rots of cotton in various countries is briefly reviewed. Microscopic examination of unopened diseased bolls from a number of localities showed that *Nematospora gossypii* was the common species of fungus concerned in South Africa, although *N. coryli* was found in one field in the northern Transvaal [*cf. R.A.E.*, A, xv, 243]. It is certain that species of *Nematospora* are the organisms most usually associated with the early stages of internal boll disease. The two species of *Nematospora* proved unable to effect an entry when cultures were painted on the surface of sound green bolls, but when introduced through a needle puncture, they spread through the lint and produced a discoloration similar to that which occurs under natural field conditions. Observations showed that, where the staining was incipient or localised, it always appeared to start in the lint lying next to the boll coat and to spread inwards. Where the punctures were few, the discoloration began in their neighbourhood, and in no case was *Nematospora* found in unopened, unpunctured bolls. Extended field observations leave little doubt that internal boll disease arises as a result of attack by *Dysdercus* [see preceding paper], and experiments in which cotton plants were enclosed in muslin cages confirmed this, for in cages in which no stainers were enclosed, 87 per cent. of the bolls were healthy, whereas in two series in which stainers were included, 81 and 90 per cent. of the bolls showed discoloured lint with many punctures and proliferations. The author has demonstrated (by dissection and culture-plate studies) the presence of *Nematospora* in a living condition within the mouth-parts and digestive tract of stainers feeding on infected cotton, and general evidence seems to indicate that it is carried by insects and does not reach the punctures merely by chance, as otherwise it would be difficult to explain the prevalence of this particular organism when a large number of wound parasites are equally likely to be in accidental proximity to the punctures.

Observations were made on malvaceous plants, especially weeds in the neighbourhood of cotton fields, but their seeds were not found to be infected with *Nematospora*. On the other hand, infected beans were obtained from several sources, *N. coryli* being the organism most usually present, although *N. gossypii* also occurred. Seeds of *Bauhinia galpini* growing in a garden in Pretoria were found infected with *N. coryli*, and *N. gossypii* was obtained by culture from the seeds of an isolated tree of *Sterculia platanifolia* growing close to cotton fields, but whether, in this case, the fungus was internal or merely external could not be ascertained. This tree was selected by the stainers as a breeding-place during the spring and summer, and when they migrated to the cotton fields in April, a corresponding development of lint staining, associated with *N. gossypii*, began to appear in the rows first invaded.

Hill (G. F.). **White Ant Investigations in the Federal Capital Territory.**—*J. Council Sci. Ind. Res.*, iii, no. 4, pp. 220–224. Melbourne, November 1930.

Among the injurious species of termites in the Federal Capital Territory of Australia, *Eutermes* (*E.*) *exitiosus*, Hill, which is widely distributed and causes injury to wooden structures in general, is the most important. Experiments are being conducted in which various pines and native timbers, and wood treated with preservatives, are being exposed to this species as well as *Coptotermes* spp., which are the next in economic importance. Attempts to maintain colonies of *Coptotermes* in the laboratory have failed, whereas those with other genera have been more successful, *E. exitiosus* having been uninterruptedly fed on treated and untreated wood for several months. The laboratory technique and methods employed in rearing are described. A feature of these tests has been the marked reduction in the time required to obtain definite data, as shown by the fact that wood specimens that were satisfactorily tested in from 17 to 22 days were cut from larger specimens that in most cases had resisted nine months' exposure to attack in mounds of the same species. Investigations conducted to determine the agents responsible for the destruction of forest trees show that *Porotermes adamsoni*, Frogg., and *Calotermes insularis*, Wlk., are the principal cause. Neither of these species has been previously recorded as attacking living timber. Termites received for identification included *Mastotermes darwiniensis*, Frogg., causing injury to subterranean telephone cables in north Queensland, and *Hamitermes* sp., damaging indigenous pastures in New South Wales.

Tillyard (R. J.). **Entomological Control of St. John's Wort—First Liberations of** *Chrysomela* **Beetles.**—*J. Council Sci. Ind. Res.*, iii, no. 4, pp. 231–232. Melbourne, November 1930.

Details are given of the liberations of *Chrysomela varians*, Schaller, *C. didymata*, Scriba, and *C. hyperici*, Forst., for the control of St. John's wort [*Hypericum perforatum*] in several localities in New South Wales and Victoria. The first named is viviparous [*cf.* *R.A.E.*, A, xv, 658], and its rate of development is therefore more rapid than that of the other two species. Both *C. didymata* and *C. hyperici* deposit eggs, which take 8–10 days or more to hatch. The average number of eggs or larvae deposited by a female of either species is about 1,000. The life-cycle from egg or larva to adult during the summer is about six weeks.

Tillyard (R. J.). **The Work of the Division of Economic Entomology for the Year 1929–30.**—34 pp. typescript. [Canberra, Council Sci. Ind. Res., 1930.]

An account is given of the organisation, personnel and general routine work of the Division of Economic Entomology in Australia for the year 1929–30. Other information has already been noticed [see the two preceding papers and *R.A.E.*, A, xix, 116].

Tests to determine whether *Tyria jacobaeae*, L., which is to be used for the control of ragwort (*Senecio jacobaea*), will feed on *Eucalyptus* and *Acacia* have proved negative, and permission has been obtained to liberate this moth.

MUNGOMERY (R. W.). **Fumigation for Cane Grubs.**—*Queensland Agric. J.*, xxxiv, pt. 6, pp. 562–563. Brisbane, 1st December 1930.

Soil fumigation against Lamellicorn larvae attacking sugar-cane in Queensland produces severe wilting in young plant cane, and it is therefore essential that land should be freed from infestation before planting. For this purpose a rotary cultivator may be used, as the revolving knives cut up the stools into small pieces, killing many of the grubs and rendering others more liable to exposure by the ploughing that follows this system of cultivation. For fumigating older plant cane or first ratoon cane, a mixture of two parts carbon bisulphide to one of liquid dichlorobenzene is recommended. Two injections should be made at a depth of 4 ins., one on either side of a stool; for larger stools three or four injections may be necessary.

[**Distribution of** *Oryctes* **in the South Pacific.**]

Information has been received through the Colonial Office from the High Commissioner for the Western Pacific that in consequence of the recent discovery of the rhinoceros beetle [*Oryctes*] in Wallis Island and Futuna (Horne) Island, a Proclamation (no. 4 of 1931) has been issued prohibiting the importation of plant matter from them into the Gilbert and Ellice Islands.

[KHACHAPURIDZE (N. V.).] **Хачапуридзе (Н. В.). Ueberblick der wichtigsten landwirtschaftlichen Schädlinge Georgiens im Zeitraum 1926–1928.** [Review of the chief agricultural Pests of Georgia for the Period 1926–28 (with brief historical Notes on them). (*In Russian.*)]—*Mitt. PflSchAbt. Volkskom. Landw. S.S.R. Georg.*, no. 1, pp. 13–32, 1 fig., 1 map. Tiflis, 1930. (With a Summary in German.)

A list is given of a number of agricultural pests observed in Georgia, with notes on the bionomics of the most important ones, which include in addition to some mentioned in subsequent papers of this series: *Myzus* (*Myzoides*) *tabaci*, Mordv., *Heliothis obsoleta*, F. (*armigera*, Hb.), and *Euxoa* (*Agrotis*) *segetum*, Schiff., on tobacco; *Eurydema festivum*, L., on cabbage; and *Polyphylla olivieri*, Lap., *Agriotes gurgistanus*, Fald., *Omophlus* sp., and *Polychrosis botrana*, Schiff., on vines.

[KALANDADZE (L. P.).] **Каландадзе (Л. П.). Zur Biologie der Blutlaus** (*Schizoneura lanigera* **Hausm.**). [On the Biology of the Woolly Aphis (*Eriosoma lanigerum* Hausm.). (*In Russian.*)]—*Mitt. PflSchAbt. Volkskom. Landw. S.S.R. Georg.*, no. 1, pp. 51–86, 3 figs., 1 graph, 6 refs. Tiflis, 1930. (With a Summary in German.)

A briefer account of these observations on *Eriosoma* (*Schizoneura*) *lanigerum*, Hausm., in the Rhine Palatinate and in Georgia has already been noticed [*R.A.E.*, A, xviii, 294].

[Sifroshvili (N.).] **Сифрошвили (Н.).** *Theresia ampelophaga* **Bayle und ihre Bekämpfung in Georgien.** [*T. ampelophaga* and its Control in Georgia. (*In Russian.*)]—*Mitt. PflSchAbt. Volkskom. Landw. S.S.R. Georg.*, no. 1, pp. 87–106, 5 refs. Tiflis, 1930. (With a Summary in German.)

Observations carried out in 1928 on *Theresia ampelophaga*, Bayle, in western Georgia, where this Zygaenid is an important pest of vines, showed that there is one generation a year and a partial second, the adults of which appear at the end of September and probably die without ovipositing. All stages are described. Some of the information given on bionomics and control is similar to that already noticed [*R.A.E.*, A, xiv, 227]. The main flight of adults occurs from about 20th June to 20th July. A female usually lays 400–450 eggs, which hatch in 11–12 days. The larvae appear in July and enter hibernation in August in the vine shoots and bark of the vines and in poles used to support them. They cause severe damage in spring, when they attack the buds, and later feed on the lower surface of the leaves. Before preparing a cocoon for pupation, they spin nests in the loose bark of old vines and poles, in which they remain for about 20 days without feeding. The pupal stage occurs in June and lasts about 17 days.

In 1928 about 25 per cent. of the pupae were parasitised by Chalcids, 5–8 occurring in each pupa. The eggs and the mature larvae resting in nests before pupation are destroyed by mites, and the larvae of the first three instars are attacked by *Apanteles* sp., each caterpillar harbouring 2–10 parasite larvae.

To destroy the larvae hibernating in the poles used to support the vines, the poles should be submerged for 30 minutes or more in a mixture of about 8 pints kerosene, 2 lb. lime and 14 gals. water, but to reduce the available hibernation quarters, it is preferable to train the vines on espaliers. To prevent the larvae from entering the shoots for hibernation, these should be pruned through the nodes where the tissue is too hard for the larvae to eat their way into it. Sprays of lead arsenate and Paris green only killed about 55 per cent. of the younger larvae in the spring ; the more mature ones did not feed on the poisoned leaves. About 70 per cent. of the larvae were killed with sprays of soft soap or oil emulsion.

[Aleksidze (N.).] **Алексидзе (Н.). Vorläufige Daten des Studiums der *Phylloxera* und der Widerstandsfähigkeit der Weinrebensorten.** [Preliminary Data on the Study of *Phylloxera* and the Resistance of Vines. (In Russian.)]—*Mitt. PflSchAbt. Volkskom. Landw. S.S.R. Georg.*, no. 1, pp. 107–130. Tiflis, 1930. (With a Summary in German.)

Laboratory and field observations on *Phylloxera* carried out in eastern Georgia in 1927 and 1928 showed that the life-cycle of the root form from egg to egg is completed in 11–43 days, depending on the quality of the food. At a temperature of 25° C. [77° F.], embryonic development lasted $3\frac{1}{2}$–7 days. Larvae hatched from eggs submerged in water, the temperature of the air being 19–21° C. [66·2–69·8° F.]. Three complete generations and a partial fourth were obtained in the laboratory between 15th July and 15th October. The life of the adults lasted 47–73 days, being shorter if a larger number of eggs was deposited daily. The maximum number of eggs laid by a female was 181. Nymphs were observed in nature on 17th July in 1927,

and on 15th July in 1928, when they occurred till 25th September on roots in the soil, as well as on aerial ones. The nymphal stage lasted 5–7 days. The first alatae were found in the field on 21st July; in the laboratory each laid 1–3 eggs, from which sexual forms hatched in 7–12 days. The Aphids began to enter hibernation in September and all had done so by 12th December in the vineyard, the average temperature of the soil at the surface being 6·1° C. [about 43° F.], and at a depth of 12 ins. 7·4° C. [about 46° F.]. Most of the Aphids occurred at a depth of about 20 ins. in the soil, but in one locality they were found as deep as 14 ft. The wandering larvae were found on vines from the end of July to the end of September, at heights varying from about 1 to 6 ins., being frequently blown by the wind to the ground or on to other vines.

The leaf form of *Phylloxera* is widely distributed in western Georgia, but in the eastern part occurs in one locality only. In 1928, two generations were produced in the laboratory from mid-August to early October on vines received from western Georgia. The resistance of local varieties of vines to the attacks of the root and leaf forms is discussed.

[Khachapuridze (N.).] **Хачапуридзе (Н.). Ergebnisse der Untersuchungen über die Reblausverbreitung in Georgien.** [Results of the Investigations on *Phylloxera* in Georgia. (*In Russian.*)]—*Mitt. PflSchAbt. Volkskom. Landw. S.S.R. Georg.*, no. 1, pp. 131–149. Tiflis, 1930. (With a Summary in German.)

An account is given of investigations carried out in 1927 and 1928 on the presence of *Phylloxera* in five districts in Georgia, the topography and climatic and soil conditions of which are briefly discussed. Root forms occurred in all the vine cultivating areas, which extend to an altitude of 4,000 ft., the rate of infestation varying from 35·5 to 100 per cent. In one instance the leaf form was also found in August at a height of over 3,000 ft. in a locality where the temperature from May to September averages 16° C. [60·8° F.], and in September falls to 6–14·8° C. [42·8–58° F.], numerous galls being formed on American vines and hybrids. This is of interest in view of statements that a temperature of at least 18° C. [64·4° F.] is essential for the development of galls on the leaves. The resistance of the local varieties of vines to infestation is discussed; it may be increased by improved methods of cultivation. Attempts should be made to determine localities in which the composition of the soil would be unfavourable for the development and spread of *Phylloxera* and where new vineyards could be established.

[Tzereteli (L.) & Chelidze (M.).] **Церетели (Л.) и Челидзе (М.). Die Prüfung der Bekämpfungsmittel gegen die Schädlinge und Krankheiten der Obstbäume.** [Tests of Control Measures against Pests and Diseases of Fruit Trees. (*In Russian.*)]—*Mitt. PflSchAbt. Volkskom. Landw. S.S.R. Georg.*, no. 1, pp. 150–188, 9 refs. Tiflis, 1930. (With a Summary in German.)

The chief orchard pests in central Georgia include *Cydia* (*Carpocapsa*) *pomonella*, L., *Vanessa* sp., *Hyponomeuta malinellus*, Zell., *H. variabilis*, Zell., *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, auct.), *Porthetria* (*Lymantria*) *dispar*, L., *Eriosoma lanigerum*, Hausm., and *Anthonomus pomorum*, L. An account is given of laboratory and small scale field experiments against the first three with arsenical sprays and dusts, including some proprietary brands.

[Tulashvili (N.).] **Тулашвили (Н.). Beobachtungen über die Schädlinge des Teestrauches und der Citrusgewächse (Citronen, Apfelsinen) am Strandgebiet Batum im Laufe von 1927–1928.** [Observations on Pests of Tea and *Citrus* on the Batum Coast during 1927–28. (*In Russian*.)]—*Mitt. PflSchAbt. Volkskom. Landw. S.S.R. Georg.*, no. 1, pp. 189–230. Tiflis, 1930. (With a Summary in German.)

Of the tea pests studied near Batum in 1927 and 1928, the Tineid, *Parametriotes theae*, Kusn., which has one generation a year, is the most common and important. The eggs, larvae and adults are described. In 1927 the moths were on the wing from the beginning of June until the end of September, but in 1928 the flight began a month later. Eggs are deposited singly on the lower surface of the previous year's leaves ; dissected females contained 25–35 completely developed ova. The larvae hatch in 3–6 days ; their habits and the damage caused are discussed [*R.A.E.*, A, iv, 334]. The infestation is concentrated on the lower and outer parts of the bushes. In many instances *Camellia japonica* and *C. sasanqua* were more severely infested than adjoining tea. For control, the bushes should be pruned to a spherical shape and the prunings burnt ; this should be done in the second half of December, when the larvae have passed from the leaf mines into the shoots, and between mid-May and the end of June, or if the spring is late in June and early July. *Camellia*, which is often a focus of infestation, should not be planted near tea. Light traps or baits of honey and water proved ineffective against the moths.

Toxoptera aurantii, Boy. (*theaecola*, Buckt.) is another important pest of tea. In 1928 10–50 per cent. of the shoots were infested, and eleven parthenogenetic generations occurred between mid-July and October. The Aphids were also observed on *C. japonica* and *C. sasanqua*. The larvae and the apterous and alate parthenogenetic females are described. Predacious enemies included Syrphids, Chrysopids, Coccinellids and spiders. About 99 per cent. of the Aphids were killed by sprays of tobacco decoction (1 lb. low grade tobacco to 6 gals. water) or a solution of 3 lb. soap in 6 gals. water.

Eriophyes carinatus, Green, infested 20–50 per cent. of the tea bushes, being especially abundant on the slopes of the hills and in neglected plots. The mites occurred chiefly on the lower surface of the leaves, which become reddish-brown in colour, acquire an unpleasant smell and wither. About 80 per cent. were killed by spraying with 1 lb. soft soap to 3 gals. water, or with an emulsion of 5 gals. kerosene, 10 gals. water and 2½ lb. soft soap, diluted 1 : 10. Other pests of tea in addition to those already recorded [*loc. cit.*] were, in order of their importance, *Sparganothis pilleriana*, Schiff., *Gryllotalpa gryllotalpa*, L., *Euxoa segetum*, Schiff., *Tettigonia* (*Locusta*) *viridissima*, L., *Conocephalus nitidulus*, Scop., *Decticus verrucivorus*, L., *Boarmia rhomboidaria*, Schiff. (*gemmaria*, Brahm), *Maladera punctatissima*, Fald., *Agrotis ypsilon*, Hufn., *Gryllus burdigalensis*, Latr., and *Heliothrips haemorrhoidalis*, Bch. Brief notes on the bionomics of most of them are given.

The most serious pests of *Citrus* were the mite, *Paratetranychus* (*Tetranychus*) *pilosus*, C. & F., which was especially abundant in October and November, and Coccids, a list of which is given [xiv, 509], with brief notes on the biology and importance of *Chrysomphalus aurantii*, Mask., and *Lepidosaphes gloveri*, Pack., which have two generations

a year, and *Coccus hesperidum*, L., *Ceroplastes cirripediformis*, Comst., and *Pulvinaria floccifera*, Westw., which have one. Of the measures tested, the most effective against the Coccids was the kerosene emulsion used against *Eriophyes carinatus*, which killed about 80 per cent. and only slightly scorched the leaves and fruit, and the best against *P. pilosus* was a spray of 1 lb. flour to 9 gals. water, which did not, however, kill the eggs. Slight injury was caused to *Citrus* by some of the insects that occurred on tea, namely, *L. viridissima*, *C. nitidulus*, *D. verrucivorus* and *S. pilleriana*. An apparently new Scolytid of the genus *Hypothenemus* occurred chiefly in old orchards on *Citrus* trees damaged by frost or weakened by Coccids.

Papers noticed by Title only.

TRÄGÅRDH (I.). **Om barkborrarnas gångsystem. II.** [The Gallery Systems of Bark-beetles.]—*Ent. Tidskr.*, li, pt. 2, pp. 99–111, 7 figs., 1 ref. Stockholm, 1930. (With a Summary in German.) [*Cf. R.A.E.*, A, xviii, 87 ; xix, 173.]

KOMAREK (J.). **Soll in dem Versuchswesen eine Trennung der angewandten Forstzoologie (Entomologie) von übrigen Forstschutzdisziplinen verlangt werden ?** [A suggestion that Forest Entomology should be separated from other Forest Protection Sciences in Experimental Work.]—*Proc. int. Cong. Forestry Expt. Stas., Stockholm 1929*, pp. 653–654. Stockholm, 1930.

TRÄGÅRDH (I.). **Ueber den Schusterbock (*Monochamus sutor* L.) und dessen Bekämpfung.** [On *M. sutor* and its Control.]—*Proc. int. Cong. Forestry Expt. Stas., Stockholm 1929*, pp. 660–663, 3 refs. Stockholm, 1930. [*Cf. R.A.E.*, A, xviii, 268.]

KOMAREK (J.). **Der Lärchenwickler (*Grapholitha diniana*) als Fichtenvernichter.** [The Larch Tortrix, *Enarmonia diniana*, Gn., as a Pest of Spruce in Bohemia.]—*Proc. int. Cong. Forestry Expt. Stas., Stockholm 1929*, pp. 664–668. Stockholm, 1930. [*Cf. R.A.E.*, A, xviii, 664.]

SCHÜTZE (K. T.) & ROMAN (A.). **Schlupfwespen.** [A List of 270 Ichneumonids and Braconids bred from various Insects in Saxony.]—*Isis Budissina*, xii, reprint 12 pp. Bautzen, 1931.

BARBEY (A.). **Descripción de una nueva especie de Pyralidae (*Dioryctria aulloi*, n. sp.), perjudicial al *Abies pinsapo* Boiss.**—*Rev. Biol. for. Limnol.*, (A) ii, no. 3, pp. 5–10, 2 pls. Madrid, 31st December 1930. [Translation, see *R.A.E.*, A, xviii, 368.]

GRANDI (G.). **Monografia del gen. *Philotrypesis* Först. (32° Contributo alla conoscenza degli Insetti dei Fichi.)**—*Boll. Lab. Ent. Bologna*, iii, pp. 1–181, 76 figs. Bologna, 1st October 1930.

SAUTET (J.). **A propos d'*Adelina tenebrionis*, Coccidie coelomique de *Tenebrio molitor*.**—*Ann. Paras. hum. comp.*, viii, no. 6, pp. 582–589, 4 figs., 10 refs. Paris, 1st December 1930. [*Cf. R.A.E.*, A, xviii, 631.]

JUDENKO (E.). **Materjały do fauny mszyc (*Aphididae*) okolicy Puław z uwzględnieniem biologji.** [Data concerning the Fauna and Biology of Plant Lice (APHIDIDAE) from the Environs of Pulawy.]—*Polsk. Pismo ent.*, ix, pt. 3–4, pp. 129–186, 24 refs. Lemberg, 1930. (With a Summary in English.)

UVAROV (B. P.). **Wetter und Klima in ihren Beziehungen zu den Insekten.** [Weather and Climate in their Relation to Insects.]—*Z. angew. Ent.*, xvii, no. 1, pp. 156–177, 39 refs. Berlin, November 1930. [*Cf. R.A.E.*, A, xviii, 228.]

JANISCH (E.). **Ueber einige Grundfragen der Insekten-Epidemiologie. Antwort auf den offenen Brief von Herrn Dr. Bodenheimer.** [On some basic Questions of Insect Epidemiology. A Reply to the open Letter of Dr. Bodenheimer (*R.A.E.*, A, xviii, 697).]—*Z. angew Ent.*, xvii, no. 1, pp. 178–181. Berlin, November 1930.

PJATNITZKY (G. K.). **Ein neuer paläarktischer Arvenborkenkäfer aus Ostsibirien,** *Orthotomicus golovjankoi* **n. sp.** [A new palaearctic Bark Beetle, *Ips golovjankoi*, sp. n., infesting *Pinus koraiensis* in East Siberia.]—*Ent. Bl.*, xxvi, no. 4, pp. 179–182, 3 figs. Berlin, 31st December 1930.

CORBETT (G. H.). **List of Insects with their Parasites and Predators in Malaya.**—*Proc. 4th Pac. Sci. Cong. Java 1929*, iv, Agric. Papers, pp. 583–592. Batavia, 1930. [*Cf. R.A.E.*, A, xvii, 413.]

NAKAYAMA (S.). **The more important Insect Enemies of the Rice Crop in Chosen.**—*Proc. 4th Pac. Sci. Cong. Java 1929*, iv, Agric. Papers, pp. 181–183. Batavia, 1930. [*Cf. R.A.E.*, A, xvii, 705.]

NGUYÊN-CONG-TIÊU. **Trois insectes parasites des plantes cultivées.** [*Apoderus bilineatus* on *Eugenia operculata* and two Diptera on Rice in Indo-China.]—*Proc. 4th Pac. Sci. Cong. Java 1929*, iv, Agric. Papers, pp. 391–400, 37 figs. Batavia, 1930. [*Cf. R.A.E.*, A, xviii, 610.]

TAKAHASHI (R.). **Some Aphididae from Nanking, China.**—*Trans. Nat. Hist. Soc. Formosa*, xx, no. 110, pp. 273–276. Taihoku, Formosa, October 1930.

TAKAHASHI (R.). **Some Aphididae of Loochoo** [including 3 new species].—*Trans. Nat. Hist. Soc. Formosa*, xx, no. 111, pp. 317–327, 2 figs. Taihoku, Formosa, December 1930.

KEY (K. H. L.). **Preliminary Ecological Notes on the Acridiidae of the Cape Peninsula.**—*S. Afr. J. Sci.*, xxvii, pp. 406–413, 1 pl. Johannesburg, November 1930.

BALACHOWSKY (A.). **Contribution à l'étude des Coccides de l'Afrique mineure (9me Note). Addition à la faune du Nord-africain avec description de trois espèces nouvelles** [including *Phenacoccus caillardi*, sp. n., on carrot in Algeria].—*Bull. Soc. Hist. nat. Afr. N.*, xxi, no. 8, pp. 119–125, 2 pls., 9 refs. Algiers, 1930.

SWENK (M. H.). **The Food Habits of the Ring-necked Pheasant in Central Nebraska.** [Details of insects eaten, pp. 28–31.]—*Res. Bull. Nebraska Agric. Expt. Sta.*, no. 50, 33 pp., 4 figs., 13 refs. Lincoln, Neb., November 1930.

SAVAGE (J. R.). **The Relation of the Habitat to European Corn Borer** [*Pyrausta nubilalis*, Hb.] **Populations.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 936–938, 4 refs. Geneva, N.Y., December 1930. [*Cf. R.A.E.*, A, xviii, 552.]

SWINGLE (M. C.). **A qualitative Analysis of the digestive Secretions of the Larva of the Japanese Beetle** (*Popillia japonica* **Newm.**).—*J. Econ. Ent.*, xxiii, no. 6, pp. 956–958, 2 refs. Geneva, N.Y., December 1930.

CRAIG (L. C.) & RICHARDSON (C. H.). **The Calibration of Flow Meters for the Measurement of Insecticide Gases.**—*J. Econ. Ent.*, xxiii, no. 6, pp. 988–991, 2 figs., 2 refs. Geneva, N.Y., December 1930.

FROST (S. W.). **New Species of West Indian Agromyzidae (Diptera)** [including *Agromyza ipomaeae*, sp. n., on Sweet Potato in Porto Rico].—*Ent. News*, xlii, no. 3, pp. 72–76. Philadelphia, Pa., March 1931.

[Vashadze (V.).] **Вашадзе (В.). Zur Biologie der Baumwoll-Laus** (*Aphis gossypii* **Glov.) und ihrer Bekämpfung.** [A few Data on the Biology of the Cotton Aphis (*Aphis gossypii* Glov.) and its Control. (*In Russian.*)]—*Mitt. PflSchAbt. Volkskom. Landw. S.S.R. Georg.*, no. 1, pp. 245–252, 4 refs. Tiflis, 1930. (With a Summary in German.)

Observations on *Aphis gossypii*, Glov., were carried out in the Tiflis district in 1928, and a general account is given of its biology on cotton. Of the measures tested against it, the best results were obtained with 2 lb. soap in 9 gals. water ; a spray of about 2 lb. tobacco dust, 1 oz. soft soap and 3 gals. water killed 60 per cent. Early sowing may safeguard the cotton from attack. Of 205 varieties under observation, none was immune from attack, though some suffered but little injury.

[Khachapuridze (N.).] **Хачапуридзе (Н.). A brief Account of the Activities of the Department of Plant Protection of Georgia in 1926–28.** [*In Russian.*]—*Mitt. PflSchAbt. Volkskom. Landw. S.S.R. Georg.*, no. 1, pp. 253–262. Tiflis, 1930.

Notes are given on work on the control of pests of cereals, vines, fruit trees, cotton and stored products carried out in Georgia in 1926–28 and on the expenditure incurred.

Baits were very effective against *Calliptamus italicus*, L., 90 per cent. being killed by one of 1–1½ parts of sodium arsenite to 40 parts of a mixture of sawdust and bran. *Gryllotalpa gryllotalpa*, L., was successfully controlled by a bait of 20 parts boiled and pounded maize mixed with 1 part white arsenic and broadcast in infested fields at the rate of about 15–20 lb. to the acre, about 10 days before sowing.

Nunberg (M.). **Przyczynek do znajomści bleskotek (Chalcididae) jako pasorzytów korników (Ipidae).** [Contribution to the Knowledge of the Chalcidoid Parasites of Scolytids.]—*Polsk. Pismo ent.*, ix, pt. 3–4, pp. 200–208, 4 refs. Lemberg, 1930. (With a Summary in German.)

Notes are given on the following Chalcidoid parasites reared from bark-beetles or observed in their galleries, in various parts of Poland : *Pteromalus* (*Rhopalicus*) *suspensus*, Ratz., which is widely distributed in Poland, from *Myelophilus* (*Blastophagus*) *piniperda*, L., of which it parasitised 84 per cent. in one locality, *Phloeophthorus* (*Phthorophloeus*) *spinulosus*, Rey, and *Ips* (*Pityogenes*) *chalcographus*, L., and observed in the galleries of *Polygraphus poligraphus*, L., *Ips sexdentatus*, Boern., *I. typographus*, L., and *I. amitinus*, Eich. ; *P.* (*R.*) *azureus*, Ratz., from *I.* (*Pityogenes*) *bidentatus*, Hbst., *M. piniperda* and *I.* (*P.*) *quadridens*, Htg. ; *Dinotus clypealis*, Thoms., from *Phloeophthorus spinulosus*, *Cryphalus piceae*, Ratz., *Polygraphus poligraphus*, *Ips* (*Pityogenes*) *bistridentatus*, Eich., *I. bidentatus*, and about 65 per cent. of the larvae of *I. chalcographus* ; *D. bidentulus*, Thoms., from *Scolytus rugulosus*, Ratz., and *Hylesinus* (*Leperisinus*) *fraxini*, Panz. ; *Pterosema aulloi*, Merc., from *I. bidentatus* ; *Rhaphitelus maculatus*, Wlk., from *H. fraxini*, *S. rugulosus* and *S. mali*, Bech. ; the Cleonymid, *Cheiropachys colon*, L. (which completes its yearly life-cycle on *Scolytus* spp. and occurs on *Hylesinus* (*Leperisinus*) in summer only) from *S. mali*, *S. rugulosus* and *H. fraxini* ; *Elachertus* (*Entedon*) *leucogramma*, Ratz., from *S. rugulosus* ; *Rhoptrocerus* (*Pachyceras*) *xylo-*

(17559) Wt P2/3550 1,700 5/31 H & Sp Gp 52 16

phagorum, Ratz., from *I. chalcographus* and *P. poligraphus*; *Eutelus typographi*, Ruschka, from *I. chalcographus*, *P. poligraphus*, *M. piniperda* and *I. quadridens*; *Eurytoma ischioxanthos*, Ratz., from *S. mali*, *S. rugulosus*, *H. fraxini* and *I. chalcographus*; *E. flavovaria*, Ratz., from *H. fraxini*; and *E. rosae*, Nees, from *S. mali*.

The Scolytid hosts from which these parasites have been recorded in the literature are also given; *D. clypealis*, *D. bidentulus*, *P. aulloi* and *E. rosae* have not previously been reared from bark-beetles.

van Poeteren (N.). **Verslag over de Werkzaamheden van den Plantenziektenkundigen Dienst in het Jaar 1929.** [Report on the Work of the Phytopathological Service in 1929.]—*Versl. Plantenziektenk. Dienst*, no. 62, 142 pp., 11 pls. Wageningen, December 1930.

Several of the pests in Holland recorded here were noticed in previous papers [*R.A.E.*, A, xv, 107; xvi, 341; xvii, 427, 638]. *Thrips angusticeps*, Uzel, caused severe leaf-curl in beet, particularly when grown after flax, of which it is a known pest. It appears also to attack peas grown after flax. It is usually thought that *Xyleborus dispar*, F., only attacks comparatively unhealthy fruit trees, but a case is recorded in which healthy apple, plum and cherry trees appeared to be preferred by it. Another unusual infestation consisted in injury to plums by the flea-beetles, *Aphthona euphorbiae*, Schr., and *Longitarsus parvulus*, Payk. Unopened leaves of strawberry were damaged by the mite, *Tarsonemus fragariae*, Zimm., and the flower and leaf stems by *Rhynchites aeneovirens* ab. *minutus*, Hbst. Other pests included *Polia* (*Mamestra*) *oleracea*, L., on tomato; a weevil, apparently *Barynotus obscurus*, F., on cauliflowers in frames; *Triphleps majuscula*, Reut., on chrysanthemums; and *Cneorrhinus* (*Philopedon*) *plagiatus*, Schall, which destroyed grafted roses. *Nygmia phaeorrhoea*, Don., was more common than in 1928, oaks especially being infested, and *Malacosoma neustria*, L., again occurred at Amsterdam and almost defoliated many elm trees. Though not fully effective, clearing the trees by means of a fire hose is the simplest and cheapest method. In a severe infestation of a pine wood by *Diprion* (*Lophyrus*) *pini*, L., the cocoons were destroyed in numbers by wood-mice, *Apodemus sylvaticus*. In the course of experiments in combating the beet-fly [*Pegomyia hyoscyami*, Panz.], the best results were obtained by a spray of sodium fluosilicate and sugar. The best remedy against apple bugs, *Plesiocoris rugicollis*, Fall., and *Lygus pabulinus*, L., is a solution of 1–2 per mille strength, preferably 1·5, of one or other of several nicotine-soap insecticides, strongly sprayed about ten days before the apple trees come into full blossom. *Aphelinus mali*, Hald., the imported parasite of the woolly apple aphis [*Eriosoma lanigerum*, Hausm.], successfully withstood the very severe winter of 1928–29.

Beling (J.). **Ueber Mottenfestigkeit durch „Eulan neu."** [Moth-proof Quality due to "Eulan neu."]—*Anz. Schädlingsk.*, vi, no. 12, pp. 137–141, 2 figs. Berlin, 15th December 1930.

Official tests at the Imperial Biological Institute, Berlin, have proved that woollen fabrics treated with 3 per cent. of their weight of "Eulan neu" are effectively protected against injury by the clothes moth, *Tineola bisselliella*, Humm.

LEIBBRANDT (F.). **Untersuchung über die Pflanzenschäden durch arsenhaltige Schädlingsbekämpfungsmittel. I. Teil: Ueber die Ursache der Pflanzenschäden durch Arsenmittel.** [Investigation on Injury to Plants by arsenical Insecticides. Part I. The Cause of Plant Injury by arsenical Insecticides.]—*Anz. Schädlingsk.*, vi, no. 12, pp. 142–147, 2 figs., 9 refs. Berlin, 15th December 1930.

In 1928 vine growers in the Rhine districts reported serious crop losses due to injury to the vines by arsenical insecticides. An investigation at the Baden Viticultural Institute showed that damage is only done when the arsenic in the insecticide is able to penetrate into the cells of the plant-tissue, chiefly as a result of the action of atmospheric carbon dioxide on the arsenicals. In insecticides containing Paris green, the chief one with trivalent arsenic, decomposition by lime greatly facilitates this action, for the calcium arsenite that is formed readily absorbs carbon dioxide, arsenious acid being liberated. The waxy cuticle protects the tissue-cells of the plant, but when this barrier is weakened by an insecticide containing lime and having an alkaline reaction, the poison is able to reach the cells [*cf.* *R.A.E.*, A, xix, 182]. The amount of poison varies according to the compound. If air is passed through 1 per cent. suspensions of Paris green or calcium arsenate, toxic quantities of arsenic enter into solution, whereas only traces do so in the case of lead arsenate. This agrees with practical experience that lead arsenate is the only arsenical suitable for susceptible varieties of fruit trees. Besides atmospheric carbonic acid, exudates from the green parts of plants may lead to poisoning; in vines these are acid and can dissolve the arsenic in an insecticide. There are two possible methods for avoiding arsenical injury to plants. One consists in evolving an insecticide that is more stable in the presence of substances with an alkaline reaction and more resistant to the action of carbonic acid. It should contain the arsenic in trivalent form, as the quantities needed for a given insecticidal effect are much less than with the corresponding pentavalent compounds. The other method aims at modifying the composition of sprays and dusts, so as to prevent the lime from acting on the cuticle and on the insecticide, and protect the latter from the action of the atmospheric carbonic acid. A report on experiments with this object is in preparation.

PAPE (H.). **Beitrag zur Kenntnis der Biologie und Bekämpfung der Akelei-Blattwespe** (*Pristiphora alnivora* **Htg.**). [A Contribution to the Knowledge of the Biology and Control of the Columbine Sawfly, *P. alnivora*.]—*Z. PflKrankh.*, xli, no. 1, pp. 1–8, 4 figs. Stuttgart, 1931.

Reference is made to previous records of injury to *Aquilegia* by the sawfly, *Pristiphora alnivora*, Htg., and observations on it at Berlin are described. The egg-stage lasted 4–6 days, the larval 9–12, and the pupal 9–12. Pupation almost always occurred underground, usually at a depth of ½ inch, though adults could emerge from pupae at a depth of 6½ ins. Parthenogenesis sometimes occurs. In the open the first young larvae were observed early in May, the adults appearing at the end of the month. Four more generations were reared in the laboratory between June and September, and in the open both half-grown and mature larvae were found on the plants up to mid-October. The measures suggested are burying the pupae deeply by cultivation,

collection of the larvae, and the use of insecticides. Dusting on two consecutive days with a preparation of Paris green destroyed all the larvae, but two sprayings with 2 per cent. and 4 per cent. barium chloride killed only 15 and 40 per cent. respectively.

Pape (H.). **Eine bisher nicht beschriebene Form der Beschädigung von Chrysanthemumblüten durch Blattwanzen.** [A previously undescribed Injury to Chrysanthemum Flowers by Leaf Bugs.]—*Z. PflKrankh.*, xli, no. 1, pp. 8–12, 2 figs. Stuttgart, 1931.

Lygus pabulinus, L., is recorded as feeding on chrysanthemum flowers in a greenhouse in northern Germany. The attack on the petals causes spots that render the blooms unsaleable.

Babel (A.). **Normierung von Pflanzenschutzmitteln.** [The Standardisation of Insecticides.]—*Z. PflKrankh.*, xli, no. 1, pp. 19–22, 7 refs. Stuttgart, 1931.

The questions involved in standardising insecticides are discussed. It is only recently that methods have been devised for comparing the actual toxic effect on insects of various insecticides [*R.A.E.*, A, xviii, 311], and tests with them in Germany have shown a proprietary compound containing only 7·72 per cent. of As_2O_5 to be more effective than four calcium arsenate dusts with As_2O_5 contents of from 4·87 to 38·83 per cent., thus confirming that the form in which the arsenic is available is unimportant, the digestibility or solubility in the insect being the important point.

de Verteuil (J. & G.). **Thrips Control.**—*Trop. Agriculture*, vii, no. 12, pp. 332–334, 1 ref. Trinidad, December 1930.

Since 1910, *Selenothrips rubrocinctus*, Giard [*cf. R.A.E.*, A, vi, 496] has been causing increasing crop losses on a cacao estate in Trinidad, the normal yield of $3\frac{1}{3}$ bags an acre being reduced to $1\frac{1}{4}$ (the average of the five years 1924–29). Spraying with Bordeaux mixture was begun in January 1928 in one of three fields treated, four applications having been given by September 1929; the other two fields were sprayed three times and twice respectively during 1929. An increase of crop of nearly a bag an acre over that from the unsprayed fields was obtained in the year ending June 1930. The cost of spraying was greater than the value of the increased crop, but the trees were freed from moss more quickly and in a more efficient and lasting manner, without damage to fruit and flowers, than they could have been by hand. Furthermore, there was a reduction in the percentage of black pods (caused by *Phytophthora*), and it is therefore recommended to do as much of the spraying as possible between September and January, when a fair crop of fruit is on the trees. The spray kills the thrips actually present and subsequently acts as a repellent.

Division of Entomology.—*49th Ann. Rep. New York Agric. Expt. Sta., 1929–30*, pp. 61–71. Geneva, N.Y., 1931.

Notes are given on several of the more troublesome orchard pests and their control [*R.A.E.*, A, xvii, 269; xviii, 401, 402, 446, 453, 686]. Many of the larvae of *Eucosma* (*Spilonota*) *ocellana*, Schiff., which attacks cherry, peach, plum, prune, pear and quince, are destroyed by insect enemies, among which are the wasps, *Ancistrocerus*

tigris, Sauss., and *A. catskillenis*, Sauss. Leafhoppers taken on apple include *Typhlocyba pomaria*, McAtee, *Empoasca fabae*, Harr., and *E. maligna*, Walsh, and, in smaller numbers, *Idiocerus provancheri*, Van D., *Thamnotettix clitellarius*, Say, *Gypona octolineata*, Say, and *Erythroneura* sp. Apples in many orchards have also been disfigured by *Rhabdopterus picipes*, Ol., which is primarily a pest of cranberries. The codling moth [*Cydia pomonella*, L.] is still the most important pest of apples ; the injury is reduced to a minimum where the standard summer sprays are thoroughly applied, and such supplementary remedies as light and bait traps and tree banding are not considered in most cases to be worth the expense they involve. The most serious pest of pears is the pear psylla [*Psylla pyricola*, Först.], but the use of oil sprays just before the buds open effectively reduces the injury during spring and early summer. An internal Encyrtid parasite of the nymphs, *Psylledontus insidiosus*, Crawf., was numerous in one orchard. Oil sprays should not at present be used on pears for more than two successive years, as there is danger of injury to the weaker trees.

Cydia (*Grapholitha*) *molesta*, Busck (oriental peach moth) is still spreading eastward, new points of infestation constantly appearing owing to flight of the moths and the importation of infested fruit. In the Niagara area the loss in peach orchards in 1929 was estimated at about £40,000. Several liberations of parasites have been made [*cf.* xviii, 407].

The European corn borer [*Pyrausta nubilalis*, Hb.] has been studied during the year, especially with a view to the value of the egg parasite, *Trichogramma minutum*, Riley. In experiments with insecticides as sprays, calcium fluosilicate considerably reduced the number of larvae, and lead arsenate with either fish oil or oil emulsion also gave good results. None of the dusts tried was effective.

Some of the vegetable pests discussed have been dealt with in greater detail elsewhere [xviii, 16, 114, 400]. Early cauliflowers were severely damaged by *Phorbia* (*Hylemyia*) *brassicae*, Bch. (cabbage maggot), as in the previous year [xvii, 67]. Plants grown from seed sown after 1st June escaped injury. The best remedies were an aqueous mixture containing 5 per cent. bentonite and mercurous chloride 1 : 300, and a dust of gypsum and 2 per cent. mercurous chloride. Plants that were ready to transplant by late June escaped injury by *Myzus persicae*, Sulz., and *Thrips tabaci*, Lind., both of which caused considerable damage in late-sown seedbeds, and also withstood the attacks of Lepidopterous larvae. Against the Colorado potato beetle [*Leptinotarsa decemlineata*, Say], regular weekly spraying of potatoes throughout the season was of some value and gave better results than standard dust mixtures.

On spruce in nurseries, the most important pests are *Chermes* (*Adelges*) *abietis*, L., which produces pineapple-like galls at the base of new growth, and *Paratetranychus ununguis*, Jac., which feeds on the needles, causing them to turn yellow.

Gahan (A. B.). **Two new Hymenopterous Parasites of** *Tachypterellus consors* **Dietz.**—*J. Wash. Acad. Sci.*, xxi, no. 3, pp. 37–39. Baltimore, Md., 4th February 1931.

The Pteromalid, *Habrocytus lividus*, sp. n., and the Eulophid, *Entedon tachypterelli*, sp. n., were bred from the weevil, *Tachypterellus consors*, Dietz, recorded as doing considerable damage to cherries in Colorado.

Wilson (G. F.). **Insects associated with the Seeds of Garden Plants.**—*J.R. Hort. Soc.*, lvi, pt. 1, pp. 31–47, 6 pls., num. refs. London, January 1931.

Numbers of insects feed on seeds and are liable to be transported with them. This paper, compiled largely from the literature, gives information on the appearance, life-history, distribution, food-plants and control of the chief insects of this type that have been found in England, including those occurring in imported seeds. They are divided into two groups, those that feed and complete their development entirely within the seed, and those that feed partly on seeds but do not complete their development in the mature seeds.

The first group includes the Bruchids, *Bruchus pisorum*, L., in peas only, *B. rufimanus*, Boh., in beans and peas, *B. affinis*, Froel. (*flavimanus*, Boh.) in beans, *B. obtectus*, Say (bean seed beetle), the most pernicious pest of seeds, which attacks various beans, cowpeas (*Vigna catjang*) and lentils (*Lens esculenta*), *B. pruininus*, Horn, in seeds of various tropical Leguminosae, *B. baudoni*, Caill., in *Acacia* seeds, *B. chinensis*, L., in beans, cowpeas, *Cajanus indicus* and *Cicer arietinum*, *B. dorsalis*, Fhr., in seeds of *Gleditschia sinensis*, *Bruchus* sp. (near *B. cisti*, F.) in seeds of *Desmodium* sp., *B. natalensis*, Pic, in seeds of *Parkinsonia* sp., *Pachymerus cruciger*, Steph., in seeds of *Abrus precatorius*, and *Spermophagus testaceus*, Pic, in seeds of *Cassia arnottiana*.

The second group includes the Anobiids, *Sitodrepa panicea*, L., which is omnivorous, and *Lasioderma serricorne*, F., among seeds of aniseed, pumpkin, tamarind, caraway, coriander and small white beans, the Byrrhid, *Simplocaria semistriata*, F., among seeds of *Colchicum* sp., the Curculionid, *Ceuthorrhynchus assimilis*, Payk., the pupae of which were found among turnip seed, the Tortricid, *Cydia nigricana*, Steph., on peas, the Tineid, *Borkhausenia pseudospretella*, Staint., which is omnivorous, the Trypetids, *Spilographa alternata*, Fall., among seeds of *Rosa* spp. and *Phormium colensoi*, *Tephritis murina*, Doane, among seeds of *Aster foliaceus*, and *Anomoea antica*, Wied. (*Phagocarpus permundus*, Harris) (barberry fly) on seeds of *Berberis*, *Cotoneaster*, *Crataegus* and *Sorbus*, and the Agromyzid, *Phytomyza atripalpis*, Aldr., among seeds of *Anemone multifida*.

Gray (R. A. H.). **The Diamond Back Moth** (*Plutella maculipennis*) **during the Years 1914-1929.**—*J.R. Hort. Soc.*, lvi, pt. 1, pp. 48–55. London, January 1931.

Notes are given on the occurrence of *Plutella maculipennis*, Curt., in Britain during the years 1914–29, with an attempt to correlate the fluctuations in population with variations in weather conditions and parasites in the various years.

Petherbridge (F. R.) & Hey (G. L.). **Winter Spraying for the Control of the Apple Capsid Bug.**—*J. Minist. Agric.*, xxxvii, no. 11, pp. 1078–1087, 2 refs. London, February 1931.

An account is given of experiments with tar distillates and mineral oils to discover an effective means of preventing the hatching of the eggs of *Plesiocoris rugicollis*, Fall., on apples in the eastern counties of England. From the results obtained and from observations in a number

of orchards, it is difficult to determine which is the most economical of the five following methods of winter spraying.

Spraying with Long Ashton wash [*R.A.E.*, A, xvii, 120] at a concentration of 10 per cent. has given good results in some orchards [*cf.* xvii, 674] but not in others, and may cause serious injury to gooseberries and strawberries growing under the sprayed trees. In some cases this wash retarded the opening of the apple blossom buds, and a few buds were killed by it. The modified Long Ashton wash [xvii, 673] may be used at 12½ per cent. strength where the water is too hard for making the Long Ashton wash. The power of proprietary mineral oil emulsions to prevent the hatching of Capsid eggs varies considerably. Some of them, at a concentration of 7½ per cent., have given rather better results than Long Ashton washes at 10 per cent. Very little damage to the trees or to the under-crops has resulted from their use, but they do not control Aphids and are not so effective against Lepidoptera [such as *Cheimatobia brumata*, L.] as the previous washes. In several instances good control of *Paratetranychus pilosus*, C. & F. (*Oligonychus ulmi*, auct.) has been obtained. Late applications (*i.e.* at the beginning of March) appear to be the most effective. A mixture of mineral oil emulsion and one of the Long Ashton washes or ordinary tar distillate gave the best results against Capsids but caused injury to apple fruit buds and to under-crops. A mixture of this kind, containing sufficient tar distillate to control Aphids and sufficient mineral oil to control Capsids and *Paratetranychus*, appears to be the most promising general winter wash for insects on apple trees when Capsids are present, but it will probably be difficult to find one that will not injure gooseberries and strawberries growing beneath. In a mixed orchard of apples and plums, the best method would probably be to spray with a tar distillate wash at 5–6 per cent. to control Aphids on both trees, and later, before the buds begin to swell, to apply a mineral oil emulsion to the apples to control Capsids. This method is, however, more expensive than the previous methods for use on apples alone.

HOBSON (R. P.). **Calcium and Hydrogen Ion Concentration and the interfacial Tension of Pyrethrum Extracts.**—*J. Agric. Sci.*, xxi, pt. 1, pp. 101–114, 4 figs., 13 refs. Cambridge, January 1931.

With extracts of *Chrysanthemum* (*Pyrethrum*) *cinerariaefolium* as insecticides, the problem of emulsification is complicated by the fact that the two poisons present, the pyrethrins, are sensitive to alkali [*R.A.E.*, A, xviii, 486]. An exact adjustment of the hydrogen ion concentration may, therefore, be necessary to secure the optimum conditions for the stability of both the poisons and the emulsion. Accordingly, an examination was made of the effect of the hydrogen ion concentration on the interfacial tension of pyrethrum extracts against aqueous solutions. In addition, the influence of calcium ions was studied, as hard waters often have to be used for insecticides, and the soaps of divalent cat-ions tend to promote the water-in-oil type of emulsion and, even in very small amounts, may cause inversion.

The following is the author's summary : The addition of a pyrethrum extract to a petroleum solvent, semi-refined white spirit, considerably lowers the interfacial tension of the latter against water. The tension also depends upon the reaction of the aqueous phase, decreasing as the alkalinity increases. The addition of agral W.B. to a solution of

pyrethrum extract further lowers the interfacial tension more especially against acid solutions, thereby decreasing the sensitivity of the tension value to the pH of the aqueous phase. The presence of calcium salts in the aqueous phase raises the interfacial tension of solutions of pyrethrum extract. Alkaline salts counteract the effect of calcium salts, and the resulting tension values can be correlated with the ratio of calcium to hydroxyl ion concentration.

Martin (J. T.) & Tattersfield (F.). **The Evaluation of Pyrethrum Flowers** (*Chrysanthemum cinerariaefolium*).—*J. Agric. Sci.*, xxi, pt. 1, pp. 115–135, 1 pl., 3 graphs, 7 refs. Cambridge, January 1931.

The following is the authors' summary: The analytical methods of Tattersfield, Hobson and Gimingham [*R.A.E.*, A, xvii, 407] and of Gnadinger and Corl [*J. Amer. Chem. Soc.*, li, p. 3054, Easton, Pa., 1929] for the determination of the pyrethrins in pyrethrum flowers are compared and certain modifications in technique suggested. Good concordances have been obtained between analytical data and insecticidal tests employing *Aphis rumicis*, L. A new method for the rapid and approximate evaluation of unadulterated samples, employing small quantities of material, is described. Observations on the pyrethrin content of individual flowers in the various stages of development are recorded, making use of a modification of the method indicated.

Eckstein (F.). **Ueber die Bedeutung des Ohrwurms** (*Forficula auricularia*) **für den Maïs.** [On the Importance of the Earwig in Regard to Maize.]—*NachrBl. deuts. PflSchDienst*, xi, no. 1, pp. 2–3. Berlin, January 1931.

Forficula auricularia, L., was observed to be very numerous on maize in Baden in 1930, averaging 35–40 individuals to a plant in July and 3–4 to a cob in August and September. There was a remarkable coincidence between their occurrence and that of maize smut [*Ustilago zeae*], so that it is probable that the spores were inoculated by them. Once the smut had fully developed on the cobs, however, no earwigs were found on them.

Klemm (M.). **Ist der Apfelblütenstecher schädlich?** [Is the Apple Blossom Weevil injurious?]—*NachrBl. deuts. PflSchDienst*, xi, no. 1, pp. 4–5, 1 fig. Berlin, January 1931.

A survey of investigations on infestation of apple by *Anthonomus pomorum*, L., in Berlin confirms the view that no economic loss is caused by this weevil [*R.A.E.*, A, xviii, 628, etc.].

van Poeteren (N.). **Bestaat er voor ons land een Coloradokevergevaar?** [Is there Danger to Holland from the Colorado Potato Beetle?]—*Tijdschr. Plantenziekt.*, xxxvi, nos. 11–12, pp. 270–285, 4 figs. Wageningen, November-December 1930.

The present state of infestation in France by the Colorado potato beetle [*Leptinotarsa decemlineata*, Say] is reviewed, and it is concluded that the infested areas are too distant for there to be any danger of its spreading to Holland.

SCHOEN (C.) & DROST (W. J.). **Proeven ter bestrijding van appelwantsen.** [Experiments in combating Apple Bugs.]—*Tijdschr. Plantenziekt.*, xxxvi, no. 12, pp. 289–292, 1 pl. Wageningen, December 1930.

This is an account of experiments with the Long Ashton and modified Long Ashton tar distillate washes [*R.A.E.*, A, xvii, 120, 673], produced in Holland under the names Capsokrimp A and Capsokrimp B respectively [xviii, 514], against the Capsids [*Plesiocoris rugicollis*, Fall., and *Lygus pabulinus*, L.] attacking apple. Thorough spraying with the modified wash at 10 per cent. strength effectively controlled them. It is superior to the fruit-tree carbolineum hitherto used in that it makes a good emulsion with dyke water.

SARRA (R.). **Due nuovi imenotteri italiani.** [Two new Italian Hymenoptera.]—*Boll. Lab. Zool. Portici*, xxiv, pp. 223–227. Portici, 27th December 1930.

The Bethylid, *Cephalonomia nigricornis*, sp. n., described from southern Italy, is an ectoparasite of the larvae of *Scolytus* (*Eccoptogaster*) *amygdali*, Guér., and *S. rugulosus*, Ratz., infesting almond and apple, and *Tenebroides mauritanicus*, L., found in grain stores.

JOESSEL (P. H.). **Sur un Orthoptère nuisible au rosier dans la région d'Avignon.**—*Rev. Path. vég. Ent. agric.*, xviii, no. 1, pp. 3–5, 1 ref. Paris, January 1931.

The Tettigoniid, *Phaneroptera quadripunctata*, Br., is recorded as damaging the buds and peduncles of roses during September in the vicinity of Avignon.

BALACHOWSKY (A.). **Sur la valeur des "huiles blanches" dans la lutte contre les cochenilles nuisibles aux Aurantiacées et aux plantes ornementales dans le midi de la France.**—*Rev. Path. vég. Ent. agric.*, xvii, no. 10, pp. 396–406, 10 refs. Paris, December 1930.

The author reviews the advantages and disadvantages of various types of oil used as insecticides, and explains that hydrocyanic acid fumigations have largely taken the place of heavy oils in the treatment of *Citrus* and other trees in order to avoid injury to foliage. Extensive tests have recently been made at the Antibes Experiment Station with four white oils (from which all unsaturated hydrocarbons have been removed). Tables show their characteristics and the results of their use, with regard to toxicity to the various stages of different Coccids. They had a very high degree of toxicity, even for the most resistant species, and caused no injury to foliage. They may, therefore, be used at all seasons, and it is predicted that they will become the chief insecticide for horticultural use throughout Mediterranean and tropical countries.

HOVASSE (R.). **Les insectes nuisibles au noisetier en Turquie.**—*Rev. Path. vég. Ent. agric.*, xvii, no. 10, pp. 407–412. Paris, December 1930.

The Turkish hills bordering the Black Sea produce in good years a crop of hazel-nuts [*Corylus avellana*] amounting to nearly 3,000 tons.

The crop of 1929 being almost worthless, a study was undertaken of the situation at Giresonde. It was found that the insect pests were the same throughout the district, being only rather more numerous in the moister situations. The most important was *Curculio* (*Balaninus*) *nucum*, L., both sexes of which puncture the bracts surrounding the young nut and the soft shell, remaining stationary with the proboscis buried in the flesh of the nut. When the proboscis is withdrawn, a small, rust-coloured wound is left ; frequently the nuts become entirely rust-coloured and fall prematurely, probably owing to a fungus having entered through the puncture. The author considers the feeding punctures made by the male as dangerous as the oviposition punctures of the female. The loss of crop in the year 1929 was probably due partly to the abundance of *C. nucum* and partly to the humid conditions in that year, which encouraged development of the fungus. Remedial measures suggested include collection of the adults after 10th May by shaking them from the tree on to a cloth. This should be done at dawn, before they have begun to feed, for once the proboscis is buried in the nut it is very difficult to dislodge them. The infested nuts that have fallen (in late July or early August) should immediately be collected and destroyed, and in the autumn the earth under the trees should be cultivated, in order to expose the pupae.

The Scolytid, *Xyleborus dispar*, F., though less widespread than *C. nucum*, causes severe damage, the infested branches becoming dry, broken or deformed. In some localities more than 80 per cent. of the branches were attacked. The use of trap branches of hazel or oak was advocated, but it is difficult to determine when these should be employed, as it is not certain whether there are one or two generations in a year. Apparently, a heavy infestation of an insect causing breaking of the branches that had occurred some ten years previously was due to the Lamiid, *Oberea linearis*, L., which was not found during the present survey. It was successfully dealt with by burning the infested branches. The gall-mite, *Eriophyes avellanae*, Nal., is widely distributed but does not appear to be of importance and is parasitised by the Cecidomyiid, *Arthrocnodax coryligallarum*, Targ. Minor pests found throughout the region included *Parornix* (*Ornix*) *avellanella*, Staint., *Melolontha* sp., *Haltica quercetorum*, Foudr., *Phyllobius* sp., and *Macrosiphum* (*Siphonophora*) *avellanae*, Schr.

[Vučasovik] Voukassovitch (H. & P.). **Observations biologiques sur un ennemi de la luzerne :** *Phytodecta fornicata* **Brüggem.**—*Rev. Path. vég. Ent. agric.*, xvii, no. 10, pp. 413–418, 2 figs. Paris, December 1930.

The Chrysomelid, *Phytodecta fornicata*, Brügg., has been recorded as a pest of lucerne in Europe, North Africa and Asia, but its biology is very little known. In Jugoslavia, especially in Serbia, where lucerne is being increasingly grown, it is multiplying rapidly and threatens to become one of the chief pests. The adults are found on the young shoots in April ; pairing may be observed even on cool, rainy days and is immediately followed by oviposition. Eggs are generally deposited on the leaves in groups of 2–20 ; oviposition continues for $1\frac{1}{2}$ to 2 months, the total number of eggs deposited by the females observed being always over 200, with a maximum of 335. Females captured immediately after emergence lived in the laboratory for an average of 46 days, devouring large quantities of leaves. The larvae hatch in 4–10 days

and attack first the leaves, then the petioles and the young stems, which they cut through either entirely or partly, causing the drying up of the upper part of the plant. The larva feeds for about 16 days. Of 21 plants offered for food, the only one other than lucerne (*Medicago sativa*) that was readily eaten and on which development was completed was *M. lupulina.* Pupation occurs in the soil, the prepupal stage lasting about 8 days and the pupal 6–10. The adults feed for two or three weeks on lucerne, then enter the ground during the last weeks of July or the beginning of August, and enter a diapause, which lasts throughout the winter, so that there is only one generation in a year.

DE LEPINEY (J.) & MIMEUR (J. M.). **Sur** *Glossita infuscata* **Meig. et** *Anastoechus nitidulus*, **F., parasites marocains de** *Dociostaurus maroccanus* **Thunb.**—*Rev. Path. vég. Ent. agric.*, xvii, no. 10, pp. 419–420. Paris, December 1930.

A study of the egg-pods of the locust, *Dociostaurus maroccanus*, Thnb., in Morocco has shown these to be parasitised to a large extent by the Bombyliids, *Cytherea* (*Glossita*) *infuscata*, Mg., and *Anastoechus nitidulus*, F. From the appearance of the infested egg-pods the authors conclude that the females of *Cytherea* oviposit in the interior soon after they are deposited and the larvae develop in about 3 months, feeding on the locust eggs. They then enter a diapause within the egg-pod, which begins in October and lasts for a period varying between six months and probably several years. The pupal stage lasts only about 10 days.

DE LEPINEY (J.). **Sur la biologie de** *Chondrostega maghrebica* **Joann. Espèce nuisible aux cultures du Maroc.**—*Rev. Path. vég. Ent. agric.*, xvii, no. 10, pp. 421–422. Paris, December 1930.

The Lasiocampid, *Chondrostega maghrebica*, Joann., which has been found in various parts of Morocco since 1926, attacks a variety of food-plants, among the cultivated ones being cabbage, lettuce and lucerne. The larvae appear in October and November and are active until February or March, when they construct cocoons in the soil, the adults emerging in September and October. The Tachinid, *Uclesia fumipennis*, Girsch., was reared from some of the cocoons. As many as four have been found in one host, the adults emerging when the host larvae are quite mature, from January to March. Sometimes the diapause is prolonged, and emergence may occur a year later, so that the parasite can survive without an alternative host.

TROUVELOT (B.). **Recherches expérimentales sur les déplacements à la marche et au vol de doryphores adultes.**—*Rev. Path. vég. Ent. agric.*, xviii, no. 1, pp. 6–8, 2 refs. Paris, January 1931.

Preliminary studies in large field cages on the migration of *Leptinotarsa decemlineata*, Say, show that the adults migrate from plant to plant and from one field to another. They do not appear to recognise plants at a distance, but differentiate immediately between solanaceous and other plants by contact, and their concentration in potato fields is due to the decrease in migration that occurs as soon as solanaceous plants are reached.

Théry (A.). **Note sur la présence en Afrique de *Sphenoptera gossypii* Cotes, Buprestide parasite du cotonnier aux Indes orientales.**—*Bull. Soc. Sci. nat. Maroc*, x, no. 1–6, pp. 54–56, 1 pl. Rabat, 1930.

The author expresses the view that certain of the species of *Sphenoptera* from Africa described as new by J. Obenberger are identical with *S. gossypii*, Cotes. If this is so, the distribution of *S. gossypii* includes the French and Anglo-Egyptian Sudan, Senegal and Tunis.

de Lépiney (J.). **La chaîne du Haut-Atlas et les invasions de *Schistocerca gregaria* Forsk. dans le Maroc septentrional.**—*Bull. Soc. Sci. nat. Maroc*, x, no. 1–6, pp. 62–65. Rabat, 1930.

The author is convinced that the chain of the Great Atlas does not form an unsurpassable barrier to the swarms of *Schistocerca gregaria*, Forsk., invading Morocco and quotes numerous cases when individual locusts and whole swarms were observed flying at an altitude of over 13,000 ft. The temperature limit for flight depends not only on the air temperature but also on the insolation and the internal heat of the insects ; thus a swarm was observed circling against the southern slope of Djebal Toubkal at an altitude of over 12,000 ft. and an air temperature below 10° C. [50° F.].

Rungs (C.). **Contribution à la détermination du nombre des générations annuelles du criquet pèlerin *Schistocerca gregaria* Forsk.**—*Bull. Soc. Sci. nat. Maroc*, x, no. 1–6, pp. 66–69, 1 table, 6 refs. Rabat, 1930.

The data so far published on the number of annual generations of *Schistocerca gregaria*, Forsk., are discussed, and a table is included comparing the results obtained by Mistikawy in Egypt [*R.A.E.*, A, xviii, 101] with those of Lespes and the author in two series of experiments in Morocco, where some evidence of the occurrence of two generations a year was obtained. Third stage hoppers of *S. gregaria* were collected on 17th September 1930 at Kiff, South Mauretania.

Ripley (L. B.) & Hepburn (G. A.). **The Wintering of the Natal Fruit-fly.**—*Fmg. S. Afr.*, 1930, reprint no. 89, 5 pp. Pretoria, December 1930.

An account is given of observations carried out on the overwintering of *Ceratitis* (*Pterandrus*) *rosa*, Ksh. (Natal fruit-fly) in the colder inland districts of Natal. The adults cannot survive the entire winter in orchards in these localities, and winter trapping is therefore useless. They require plenty of food and water and have a high resistance to low temperatures. It was found that the bug-tree (*Solanum auriculatum*) harbours *C. rosa* in winter [*R.A.E.*, A, xix, 167], although honey-dew from various plants is also eaten. In May the flies enter a definite hibernation phase, when they become less active and will not react to odours to which they were attracted in summer. Attempts to interrupt this phase were unsuccessful.

Delord (A.). **Report on the Operations for the Control of** *Phytalus smithi* **(Arrow) during the Season 1929-30.**—Fol., 7 pp. Mauritius, 1930.

Details are given of the campaign against *Lachnosterna* (*Phytalus*) *smithi*, Arrow, on sugar-cane in Mauritius during 1929–30 [*cf. R.A.E.*, A, xviii, 429]. The number of beetles destroyed was 265 millions, and of larvae 137 millions. One new centre of infestation was found during the year.

Moutia (A.). **Le charançon du bananier** (*Cosmopolites sordidus* **Germ.**).—*Bull. Dept. Agric. Mauritius*, Sci. Ser. no. 17, 5 pp., 1 pl. Réduit, 1930.

The distribution of *Cosmopolites sordidus*, Germ., on banana in Mauritius has greatly increased in recent years. A brief account is given of its bionomics and control. The life-cycle varies from 36 to 88 days.

Husain (M. A.). **A preliminary Note on the White-fly of Cottons in the Punjab.**—*Agric. J. India*, xxv, pt. 6, pp. 508–526, 20 refs. Calcutta, 1931.

Investigations were started in July 1928 on *Bemisia gossypiperda*, Misra & Lamba, a pest of cotton in the Punjab. Certain mistakes in the original description of this Aleurodid [*R.A.E.*, A, xvii, 703] are corrected. The eggs are usually laid on the lower surface of the top and middle leaves of the plant. In captivity the maximum number of eggs laid by a female was 71 in 14 days by parthenogenetic reproduction, the progeny being males. The egg stage averages 4–5 days from May to October, and lasts 13 days in November, 31 in December, 13–17 in February and March and 7 in April. The length of the four nymphal instars, of which one is the pupal stage, varies from 9 to 84 days, the pupal period occupying 2–8. The nymphs soon attach themselves, usually to the lower surface of the leaves. The adults fly in large numbers on warm days when there is little wind. From the beginning of April to the end of September, a complete life-cycle may occupy 14–27 days, from October to November 36, from November to February 92–107 and in March about 30. There are probably about 10 generations a year, the broods overlapping considerably. The comparative infestation of Desi and American varieties of cotton was found to vary at different times during the season. Infestation reaches its maximum in July-September and then diminishes until during the winter the insects migrate to various alternative food-plants in the vicinity of the field.

The economic status of this Aleurodid is discussed at length. Though little is known of the real nature of the damage caused, and experimental evidence is not yet complete, it is undoubtedly a serious pest, reducing the yield through non-formation and dropping of the bolls. It lowers the vitality and injures the health of the plant, but it is highly doubtful that it is the main cause of the failure of the cotton crop, for under ordinary conditions its depredations are not sufficient to cause a total failure as experienced in certain years. Numbers of leaves were covered with nymphs and pupae, but they showed no signs of the

yellow and red colouring which characterised the attacked plants during these years, and though they were sometimes blackened by sooty mould, the plants recovered. Even in the case of American varieties, the yield was not always diminished by severe infestation.

Sharangapani (S. G.). **Entomology.**—*Ann. Rep. Dept. Agric. Bengal 1929–30*, pp. 44–46. Calcutta, 1930.

Brief notes are given on a number of injurious insects occurring in Bengal during 1929–30. These include *Cryptorrhynchus gravis*, F., and *Rhytidodera simulans*, White, on mangos; *Argyria tumidicostalis*, Hmps., on sugar-cane; *Schoenobius bipunctifer*, Wlk., on rice; *Diacrisia obliqua*, Wlk., on jute, cotton and pulses; *Aleurocanthus* (*Aleurodes*) *nubilans*, Buckton, on betel [*Piper betle*]; and *Pseudococcus nipae*, Mask., which is stated to be a serious pest of stored potatoes. *Anomis* (*Cosmophila*) *sabulifera*, Gn., was prevalent on jute during June, and branches of trees were placed in the fields as shelters for birds, which killed large numbers of the larvae. Later in the season following heavy rains, most of the remainder died as a result of a bacterial disease.

Norris (R. V.). **Quarterly Report on the Work of the Scientific Staff, Tea Research Institute.**—*Tea Quarterly, J. Tea Res. Inst. Ceylon*, iii, pt. 4, pp. 132–137. Kandy, November 1930.

In the course of breeding experiments with *Trichogramma erosicornis*, Westw., in Ceylon [*cf. R.A.E.*, A, xviii, 558], it has been found that the size and egg-laying capacity of the female increase with the size of the host egg on which it has been reared. It is therefore suggested that if a smaller species of *Trichogramma* could be obtained, its reproductive capacity would be higher, provided that it reacted in the same manner as the native species. With a view to testing this possibility, experiments are being conducted with *T. nanum*, Zehnt. As expected, the eggs of the tea tortrix [*Homona coffearia*, Nietn.] reached a maximum during the quarter under review. Collections of egg masses up to the middle of September on two estates where small liberations of *T. erosicornis* were frequently made showed an increase in parasitism from 1 to 10 per cent., whereas eggs collected elsewhere showed hardly any parasitism at all. Observations on Limacodids (nettle grubs) attacking tea are discussed [*cf.* xviii, 156; xix, 137]. Collections made during an infestation on one estate showed that at least three species were present, namely *Parasa lepida*, Cram., *Thosea cervina*, Moore, and *T. recta*, Hmps., the first named being predominant. The Zygaenid, *Heterusia cingala*, Moore, is often associated with these pests on tea and causes similar injury, especially to the mature leaves; it is effectively controlled, however, by a bacterial disease, and the Tachinid, *Exorista heterusiae*, Coq., and is also attacked by *Apanteles* sp. The results of tests with insecticides against the Limacodids are very briefly reviewed; a spray solution made from the foliage of *Tephrosia vogeli* was effective.

Jepson (F. P.). **The Termites which attack living Plants in Ceylon.**—*Rutherford's Planters' Note-book*, 9th edn., pp. 579–596. Colombo, Times of Ceylon Co., Ltd., 1931.

The situation regarding termites attacking plants in Ceylon is reviewed, and notes are given on their bionomics, geographical distribution and

control [*R.A.E.*, A, xviii, 105, 558; xix, 62, 138, 164]. A list of the species, showing the plants attacked and the localities in which the records were made, is appended.

HUTSON (J. C.). **Some Notes on the Paddy Fly in Ceylon.**—*Trop. Agriculturist*, lxxv, no. 6, pp. 341–346. Peradeniya, December 1930.

Much of this information on *Leptocorisa varicornis*, F., on rice in Ceylon has already been noticed [*R.A.E.*, A, xi, 311]. Its prevalence and importance are due to its ability to survive periods when food is scarce and delay oviposition until favourable breeding conditions prevail, and to the fact that it infests the maturing rice from the flowering stage onwards, so that the injury caused is serious. The severity of the attack is comparatively slight if large areas are sown with varieties of rice that flower and ripen at approximately the same times. The usual control measures have little actual effect, and investigations should be undertaken with special reference to control by biological methods.

VAN DER GOOT (P.). **De Agromyza-vliegjes der inlandsche katjang-gewassen op Java.** [The Agromyzid Flies of native leguminous Plants in Java.]—*Meded. Inst. PlZiek.*, no. 78, 97 pp., 8 pls., 26 refs. Buitenzorg, 1930. (With a Summary in English.)

Agromyza (*Melanagromyza*) *phaseoli*, Coq., causes serious damage to various beans in Java, but *A.* (*M.*) *sojae*, Zehnt., and *A.* (*M.*) *dolichostigma*, de Meij., are of no economic importance, the former, which has often been erroneously recorded as injurious to beans, being found inside the pith of the stems of soy bean [*Glycine hispida*] and other plants, and the latter causing a withering of the tops of *Phaseolus calcaratus*, soy bean, and *Calopogonium mucunoides*. The three species are described, with detailed notes on their life-history, food-plants, and parasites. *A. phaseoli* is particularly injurious to French beans, which are grown in the hills between 1,300 and 4,000 ft. Soy beans are attacked only on tilled land, and not when sown in rice-stubble as is the usual practice.

At Buitenzorg, the egg, larval and pupal stages averaged 2, 10 and 9 days, respectively, but at an altitude of about 4,000 ft. the corresponding figures were 3–4, 17–22 and 13–20, so that total development required 39–47 days, with an average of 43 in the cooler months at 14–23° C. [57·2–73·4° F.] and 30 in normal months at 18–25° C. [64·4–77° F.]. The eggs are deposited on the leaves exclusively; an average of 56 were laid per female. At Buitenzorg there was a maximum of 14 generations a year, and in captivity the flies had an average life of 19 days. The females feed on sap in wounds specially made in the leaves with the ovipositor. A list is given of plants susceptible to and immune from attack, with notes on the method of injury and losses caused. The native food-plants recorded are *Phaseolus semierectus*, *Crotalaria juncea*, *C. quinquefolia* and *C. retusa*. Cowpeas (*Vigna sinensis*) are severely attacked, but no injury is caused to them, contrary to experience in other countries. Of soy beans, no completely resistant or immune varieties have been observed.

No larval or egg parasites have been found, but four parasites were obtained from the pupae, *viz.*, *Eurytoma poloni*, Gir., *Trigonogastra agromyzae*, Dodd, *Eurytoma* sp. and a Cynipid. Notes are given on their

morphology and bionomics. The average rate of parasitism is only 5 per cent. *A. sojae* and *A. dolichostigma* have much the same parasites, the percentages of parasitism in them being 30 and 10 respectively.

No direct measure against *A. phaseoli* has been found satisfactory. The promotion of vigorous growth in French beans by the use of manure is of some assistance. Beans should be planted at about the same time, and two crops of a susceptible plant should not be grown consecutively. For soy beans on tilled fields, fairly good results are obtained by covering the ground with rice-straw ; and growing on fertile soil and in the rainy season is recommended.

JARVIS (E.). **Report by Entomologist in charge at Meringa [1929-30].**—*30th Ann. Rep. Bur. Sugar Expt. Stas. Queensland,* pp. 42–46. Brisbane, 1930.

Some of this information on sugar-cane pests in Queensland has already been noticed [*R.A.E.*, A, xviii, 107, 464, 704]. *Lepidoderma albohirtum,* Waterh., continues to be the most important pest in the north of the State. It is difficult to control owing to the fact that most of the cane fields are more or less surrounded by scrub or forest country within which this indigenous insect continues to breed. Damage by *Rhabdocnemis obscura,* Boisd., has been reduced to a minimum for the present, owing to the activity of the parasite, *Ceromasia sphenophori,* Villen., which has gradually become established in many infested localities. As no machine for burying the dry crystals of paradichlorobenzene is at present available, fumigation against cane grubs was carried out in the field by dissolving the crystals in carbon bisulphide, using 80–85 lb. of the former, in approximately the same quantity of the latter, to each acre. The maximum amount applied to a large stool of cane was about 22 cc. in separate injections of 4–5 cc. Orthodichlorobenzene killed 100 per cent. of cane grubs confined in cages containing moist soil within three days, but when injected at the rate of 7 cc. within 3 ins. of cane stools, caused wilting and the ultimate death of the cane plants. When it was mixed with carbon bisulphide and injected 6 ins. from cane plants in the field, slight wilting took place and living grubs were found under treated stools. This form of dichlorobenzene is believed to be extremely poisonous to plants.

In the course of rearing work, it was found that the total life-cycle of *Campsomeris tasmaniensis,* Sauss., during the hottest part of the year, when the mean shade temperature was 87° F., occupied 47 days in the case of males and 50 in that of females. When the winter brood was reared, however, it was found that the time required for the completion of the combined egg and larval stages was 18–24 days as compared with 12 during the summer, and that the life-cycle was completed in 90–100 days during June-September, when the average shade temperature was 68° F.

MUNGOMERY (R. W.). **Report by Assistant Entomologist at Bundaberg and Mackay.**—*30th Ann. Rep. Bur. Sugar Expt. Stas. Queensland,* pp. 47–48. Brisbane, 1930.

During 1929–30 injury by sugar-cane grubs was, on the whole, more severe than during recent years, *Lepidiota frenchi,* Blkb., *L. trichosterna,* Lea, and *Pseudoholophylla furfuracea,* Burm., causing serious damage in various districts. Many soil fumigants were tested during the year,

the most promising being a mixture of 2 gals. carbon bisulphide and 1 gal. liquid dichlorbenzol [*cf. R.A.E.*, A, xix, 235]. The latter is a commercial product consisting of approximately 10 per cent. paradichlorobenzene and 90 per cent. orthodichlorobenzene. Mortalities as high as 92 per cent. were obtained with this material on typical grub-infested land. Carbon bisulphide emulsions have not proved satisfactory, owing to the irregular distribution of the cane-grubs in the soil, and also to the tendency of the earth to ball where the liquid is injected. The fumes do not penetrate far beyond the point of injection, and sprinkling the fumigant on the surface of the soil would prove too costly.

The winged form of the cane-root Aphid was obtained during the year and the species has been identified as *Geoica lucifuga*, Zhnt. The Aleurodid, *Neomaskellia bergi*, Sign., which has been comparatively scarce during recent years, suddenly appeared in large numbers on sugar-cane in widely separated parts of the State, but was soon reduced to negligible proportions by the activity of a number of predators.

LYSAGHT (A. M.). **Bronze Beetle Research. Report for the two Years ending November 1929.**—*Bull. N.Z. Dept. Sci. Indust. Res.*, no. 25, 32 pp., 22 pls., 63 refs. Wellington [N.Z.], 1930. Price 1*s*. 6*d*.

Detailed descriptions are given of the larva, pupa and adult of *Eucolaspis brunnea*, F. (bronze beetle). This Eumolpid is widely distributed throughout New Zealand ; the prevailing westerly winds have probably assisted largely in dissemination. The beetles feed on fruit and foliage ; they appear to be practically omnivorous and are far more numerous on introduced than on native plants. The most serious damage occurs on apples, which are attacked when small, large scabs forming where the beetles have nibbled and abnormal growth resulting. Short-stemmed varieties are the most severely attacked, 40 per cent. of the crop being sometimes destroyed. The stems of the clusters of currants are bitten, so that the half-ripe fruit withers and falls ; gooseberries are eaten through to the pulp ; the leaves and fruit of cherries are attacked ; in the case of raspberries the half-formed fruit is eaten, but the greatest damage is due to defoliation, which may completely ruin the late crops. Leaves are attacked from the lower surface and riddled with small holes. Considerable injury is caused to trees in this way, plums being sometimes completely defoliated. The larvae live on grass roots and do no appreciable damage. The ggs are deposited in the ground in an earthen capsule, which may consist of one or several cells ; usually there are 3 or 4 eggs in each cell and up to 11 in the whole capsule. Eggs were found from the end of November to mid-February and hatched in from 15 to 22 days according to the weather. Full-grown larvae were found throughout the year in the field ; they were most abundant in uncultivated soil round apricot and apple trees. In well-cultivated orchards they were scarce, but were plentiful in the roots of the scrubby grass at the boundaries. In the summer larvae were found within 2 or 3 ins. of the surface of the soil, but in winter they were deeper down. There is a long pre-pupal period ; no pupae were observed in the field before early October. Pupation occurs in a small earthen cell 1–8 ins. below the soil surface, and the pupal stage may last as long as $3\frac{1}{2}$ weeks. The adults are on the wing from early November to mid-January. Male beetles kept in cages lived from 10 days to 8 weeks, and females not longer than 5 weeks.

Males seem to preponderate slightly in the field. The females buried themselves for as long as 24 hours before ovipositing and would only oviposit if the soil was left undisturbed for 2–4 days. Eggs were not laid in wet soil, the preferred soil being dry and lumpy.

Biological control of this species seems to be limited to the work of predacious larvae of Carabids and Asilids, and that of birds when the soil is under cultivation. Constant and careful cultivation in the orchards, especially during November-January, does much to reduce infestation, and clean farming in areas adjoining orchards, and the removal of scrub and rubbish which might attract the adults, is of supplementary value. In laboratory experiments lead arsenate as an insecticide had very little value. Sodium silicofluoride dust, which was used on various kinds of foliage, acted as a repellent, but the beetles were poisoned by collecting it on their tarsi and antennae. No scorching of dry leaves occurred, but under moist conditions a carrier would be necessary. A 0·5 per cent. solution was tried as a spray; it was as toxic as the dusts but caused slight scorching. Sodium arsenite (0·5–5 per cent.) damaged the foliage severely; modifications of this spray are being tested. A 1 per cent. oil spray was moderately toxic, but the strength necessary for a lethal dose was not determined. The results of these experiments are shown in a table, and the technique of rearing the larvae is described.

FULLAWAY (D. T.). **Some practical Considerations in Plant Quarantine.** —*Proc. 3rd Pan-Pacific Sci. Cong. Tokyo, 1926*, i, pp. 1119–1123. Tokyo [1928]. [Recd. 1931.]

The problem of plant quarantine is discussed from the Pan-Pacific point of view. Although it is obviously impossible under modern conditions entirely to exclude insect pests by quarantine, it is nevertheless a valuable means of protection and should be rendered as efficient as possible. This may be done by intensive study of the distribution, habits and ecology of the insects concerned. A record should be kept of all captures in quarantine work, and the insects thus collected should be studied and identified, and the facts of their interception promptly published. Such records kept over a number of years would be an aid to determining the risks involved in admitting plants of a certain kind and class. Many regions in or bordering on the Pacific, as yet imperfectly explored for insects, should be further investigated, and the methods of publishing entomological information, which in certain countries are inefficient, should be reorganised. The factors preventing the acclimatisation of introduced or immigrant insects in foreign countries should also be studied. As prohibitions are almost impossible to enforce in practice, the major part of the work must be exercised through the usual procedure of inspection. It is of great advantage to have quarantine grounds maintained by the government where imported plants can be kept under observation for a fixed period. The first seed canes introduced into Hawaii for 22 years were collected in the first place by an expert, grown in quarantine at Washington for a year, during which all diseased stools were removed and cuttings were taken from the survivors, and brought to Honolulu where they were again placed in quarantine for a year, the results proving highly satisfactory. Plant quarantine work might also be improved by co-operation to secure uniformity in methods of inspection, disinfection and certification, and an agreement should be arrived at between the various

countries to ensure prompt notification of the appearance of a destructive pest. The education and training of field inspectors is an important factor, and the co-operation of the public should be invited by popular lectures, broadcasting and publications dealing with important phases of plant quarantine work.

HARUKAWA (C.). **Scientific Bases of Plant Quarantine in the Countries of the Pacific.**—*Proc. 3rd Pan-Pacific Sci. Cong. Tokyo, 1926*, i, pp. 1131–1140. Tokyo [1928]. [Recd. 1931.]

By taking into consideration the zoogeographical positions of the countries in the Pacific, it is possible to some extent to predict whether an insect indigenous to a certain country will become established in another into which it may be imported. A brief account is given of the insect fauna of Japan, which belongs to the palaearctic region and has a climate differing considerably from that of India or the Malay Peninsula. In spite of this difference in climate, many insects that are indigenous to the oriental region are now found in Japan, besides those that are typically palaearctic species, but it is not possible to draw any line dividing Japan into palaearctic and oriental regions. Typical examples are given of species occurring in the different Japanese Islands and their general distribution. It is shown that certain species of these insects are resistant to changes in environmental conditions and can thrive in a new environmental complex. Studies on the physiological and ecological characteristics of injurious insects are therefore highly important as facilitating predictions as to whether they will thrive in a new country and determination of the extent to which their activities may be modified by transport into a new environment. Thus *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.) is possibly not confined to rice in Ceylon, though it feeds exclusively on this plant in Japan. It has 5 or 6 generations a year in Formosa and 2 or 3 in western Honshu, but does not occur in the north-eastern portion of the country. Similarly, *Cydia* (*Laspeyresia*) *molesta*, Busck, has 2 or 3 generations a year in northern Honshu, and 6 in Kyushu or western Honshu. Both these insects seem to have remarkable powers of tolerating much higher or lower temperatures than those of their original habitat. As they proceed northwards, the number of generations decreases, and at a certain latitude they disappear. The injury done varies with the number of annual generations, although it may not be in direct proportion. This must be taken into consideration in estimating the probable extent of injury caused by an insect imported from other countries.

YUASA (H.). **On the Advantage of the X-ray Examination of certain Classes of Materials and Insects subject to the Plant Quarantine Regulations.**—*Proc. 3rd Pan-Pacific Sci. Cong. Tokyo, 1926*, i, p. 1141. Tokyo [1928]. [Recd. 1931.]

This paper, of which only an abstract is given, advocates the use of X-rays for revealing the presence of such insects as borers in plant material subject to quarantine. It is possible by this means to determine the situation, numbers, developmental stages, and even identity of the insect, as well as the nature and extent of the injury caused by it, without destroying its habitat or disturbing its development.

Hoffmann (W. E.). **A Stink-bug injurious to Citrus in South China.**—*Proc. 3rd Pan-Pacific Sci. Cong. Toyko, 1926*, ii, pp. 2030–2037. Tokyo [1928]. [Recd. 1931.]

The nymphs and adults of a Pentatomid, probably *Rhynchocoris humeralis*, Thnb., cause considerable damage to the fruit of several varieties of orange in Canton. It has been observed on the trees from May to November inclusive, and it hibernates as an adult. From May to September the females deposit at least 2 or 3 batches of about 14 eggs, generally on the upper surface of the leaves. Incubation lasted 9 days in May, but only 2 or 3 in July. The nymphs are gregarious at first, but disperse in the later instars. They may be found at the tips of the branches except on the highest and lowest ones. Four nymphs under observation matured in about 4 weeks. The adults are strong fliers and if disturbed once or twice may leave the orchard altogether. They are often found on a tree when none occurs on neighbouring trees, but it is not known whether this is due to gregarious habits or food selection. Adults have not been observed to mate or oviposit during the season in which they were reared, which suggests that there is only one generation annually in the region of Canton.

Large numbers of the nymphs and adults are destroyed by a Mantid, which is common in South China, and many of the egg-batches in the field were attacked by a Hymenopteronus parasite, all the eggs in the mass being infested.

Suggestions for control include capture of the adults in May by means of hand-nets, and laboratory breeding and release of the egg parasite, which appears almost simultaneously with the laying of the first eggs of *R. humeralis* and develops in a comparatively short time. The introduction of Mantid eggs or nymphs into infested orchards might also be tried.

Uichanco (L. B.). **Insects in Relation to the introduced cultivated Element of the Philippine Flora.**—*Proc. 3rd Pan-Pacific Sci. Cong. Tokyo, 1926*, ii, pp. 2069–2076, 11 refs. Tokyo [1928]. [Recd. 1931.]

The original introduction of cultivated economic plants into the Philippine Islands is discussed, and reasons are given for considering that nearly all the pests attacking these plants are indigenous, feeding at first on the native flora and subsequently attacking the introduced plants, especially those that were closely related to their original food-plant.

Corbett (G. H.). **Insects on Coconuts in Malaya.**—*Proc. 3rd Pan-Pacific Sci. Cong. Tokyo, 1926*, ii, pp. 2077–2081. Tokyo [1928]. [Recd. 1931.]

Brief notes are given on the more important pests of coconut in Malaya [*cf. R.A.E.*, A, xii, 36, 379 ; xv, 656 ; xvi, 628, etc.].

Fullaway (D. T.). *Adoretus sinicus* **and its natural Enemies in the Orient.**—*Proc. 3rd Pan-Pacific Sci. Cong. Tokyo, 1926*, ii, pp. 2086–2090, 1 ref. Tokyo [1928]. [Recd. 1931.]

An account is given of the search for natural enemies of *Adoretus sinicus*, Burm., in South China and Formosa and of their subsequent transport from Formosa to Hawaii [*R.A.E.*, A, xv, 449].

NISHIKAWA (S.). **Studies on *Gaedia puellae*, Nish. (Tachinidae) and a Disease of Silkworms caused by its Parasitism.** [*In Japanese.*]—*Rep. Seric. Expt. Sta. Gifu*, no. 7, pp. 1–277, 32 pls. Gifu, 1930.

The Tachinid parasites of the silkworm [*Bombyx mori*, L.] in Japan are *Gaedia puellae*, Nish., *Sturmia sericariae*, Rond., *Tricholyga bombycis*, Bech., and *Tachina mella*, Wlk. *G. puellae* causes serious damage in the central part of Honshu, killing the mature larvae. It has 5 generations a year, the first adults emerging from the over-wintering pupae at the end of April. The flies feed on the honey-dew of Aleurodids and the nectar of various flowers and are active by day, particularly at temperatures of 25–33° C. [77–91·4° F.]. In an experiment on their reaction to colours, yellow proved the most attractive, blue being next. The males usually live 3–4 days and the females 7–14, or occasionally 20. Mating only occurs once during life. Oviposition begins 8–12 days after emergence, one female laying from 40 to over 1,000 eggs. The eggs are laid singly on the lower surface of the leaves of mulberry or the food-plants of other Lepidopterous hosts of the parasite and hatch after being swallowed by the host larvae. The course of development of the parasites in the host larva is described; they mature in 7–25 days, and pupate in the soil or elsewhere, the pupal stage lasting 7–22 days. Various Hymenopterous parasites were obtained from the pupae; a Chilopod, *Therenopoda chinifera*, Wood, feeds on the adults, and the fungus, *Isaria farinosa*, kills the larvae.

The external and internal structure of all stages of *G. puellae* are described in detail.

TANABE (C.) & SEKIYA (I.). **Studies on *Diplosis mori*, Yokoyama.** [*In Japanese.*]—*Oyo Dobuts. Zasshi*, ii, pp. 270–281. Tokyo, 1930.

The larvae of the Cecidomyiid, *Diplosis mori*, Yokoyama, cause serious damage to the young buds of mulberry in Japan. Hibernation takes place in the larval stage in the soil, the adults first appearing about the end of June. There are usually 3, but occasionally as many as 5, broods during the summer. The eggs are laid singly on the buds and hatch in 2 days; the larvae mature in about 6 days and pupate in the soil. The pupal stage lasts 4 or 5 days in summer. The adults emerge in the evening and may live as long as 4 days. The use of mercurous chloride is recommended as an effective means of killing the larvae in the soil.

NODA (S.). **On *Trachys* sp. on Plum.** [*In Japanese.*]—*J. Plant Prot.*, xviii, pp. 36–43. Tokyo, 1931.

Descriptions are given of all the stages of a Buprestid, *Trachys* sp., the larvae of which mine in plum leaves in Kyushu, where there are at least two generations a year, the adults emerging in June and September. The eggs are usually laid on the upper surface of the leaves, and the pupal stage lasts 7–10 days.

KAWADA (S.) & SHIBAMICHI (T.). **On *Narosa edoensis*, Kawada.** [*In Japanese.*]—*Kontyû*, iv, no. 4, pp. 209–214, 1 pl., 3 figs. Tokyo, 1930.

Descriptions are given of the larva and pupa of the Limacodid, *Narosa edoensis*, Kawada, which feeds on the leaves of cherry and plum in Japan and China. The pupal stage may last over 10 months, and the adults emerge in summer.

Kinoshita (S.) & Sakai (K.). **Notes on the Distribution of and Damage done by** *Bruchus rufimanus* **in Tokyo and its Vicinity.** [*In Japanese.*]—*Kontyû*, iv, no. 4, pp. 271–276. Tokyo, 1930.

Bruchus rufimanus, Boh., was first discovered in 1930 in the neighbourhood of Tokyo, where it was found to be widely distributed [*cf. R.A.E.*, A, xviii, 615].

Hôzawa (S.). **On** *Calandra oryzae*, **L.** [*In Japanese.*]—*Rep. Jap. Ass. Adv. Sci.*, v, pp. 216–224. Sapporo, 1930.

Some of this information on *Calandra oryzae*, L., has already been noticed [*R.A.E.*, A, xviii, 535]. There are usually 5 generations a year near Tokyo, and the weevils begin to be active in April or May. The life of the adults averages 70–80 days, but may last as long as 580. A larva may eat about 43 per cent. (in weight) of a rice grain during its life. Unhusked rice is less injured by the adults than the husked grain, and moist rice is more severely attacked.

Kuriyama (S.). **On the Damage to Houses by** *Coptotermes formosanus*, **Shir.** [*In Japanese.*]—*Rep. Jap. Ass. Adv. Sci.*, v, pp. 624–631. Sapporo, 1930.

Coptotermes formosanus, Shiraki, is very injurious to buildings in Formosa, where it is more common in the north, probably owing to the greater humidity. The workers can even bore into concrete, but do not affect it by the fluids from their mouth-parts.

Maki (K.). **The Biology of** *Chelonus munakatae*, **Mats.** [*In Japanese.*]—*Sci. Rep. Alumni Soc. Morioka Agric. For. Coll.*, no. 6, pp. 43–47. Morioka, 1930.

The Braconid, *Chelonus munakatae*, Mats., of which the author considers *C. chilonis*, Cush., to be a synonym [*cf. R.A.E.*, A, xviii, 251], is parasitic in *Chilo simplex*, Butl., in Japan, where, like its host, it has two generations a year. The adults emerge in May and June and again at the end of July and in August. The eggs are laid in the eggs of *C. simplex*, the larvae maturing when the host larvae reach maturity. Pupation takes place in the rice stalks, and the adults appear a week later.

Saito (K.). **On the Injury caused by** *Dendrolimus spectabilis*, **Butl., in Korea.** [*In Japanese.*]—*Sci. Rep. Alumni Soc. Morioka Agric. For. Coll.*, no. 6, pp. 87–102. Morioka, 1930.

Dendrolimus spectabilis, Butl., and *D. sibiricus*, Tshtv., feed on conifers in Korea, the latter occurring only in the north. *D. spectabilis* attacks various species of *Pinus*, *Larix* and *Abies*, but prefers *P. densiflora.* In experiments, *P. koraiensis* and *P. strobus* were most severely injured, and *P. thunbergi*, which has hard needles, suffered least.

Reko (V. A.). **Tabakschädlinge in Mexico.** [Tobacco Pests in Mexico.] —*Nachr. SchädlBekämpf.*, v, no. 4, pp. 197–200. Leverkusen b. Köln, December 1930.

This is a brief survey of the chief pests of tobacco in Mexico, which include *Epitrix parvula*, F., *Diabrotica duodecimpunctata*, F., *Dicyphus minimus*, Uhler, *Euschistus variolarius*, P. de B., *Pseudococcus* (*Dactylopius*) *citri*, Risso, *Macrosiphum* (*Nectarophora*) *tabaci*, Perg., *Protoparce celeus*, Hb., *P. carolina*, L., *Heliothis virescens*, F. (*rhexia*, Sm. & Abb.), *H. obsoleta*, F. (*armigera*, Hb.), *Phthorimaea operculella*, Zell. (*Lita solanella*, Boisd.), *Gelechia* (*Bryotropha*) *terrella*, Hb., and *Oecanthus nigricornis*, Wlk. (*fasciatus*, Fitch). Stored tobacco is infested by *Sitodrepa panicea*, L., *Calandra oryzae*, L., *Lasioderma serricorne*, F., and *Dermestes vulpinus*, F.

Compere (H.). **A Revision of the Species of *Coccophagus*, a Genus of Hymenopterous Coccid-inhabiting Parasites.**—*Proc. U.S. Nat. Mus.*, lxxviii, art. 7, no. 2850, 132 pp., 14 pls. Washington, D.C., 1931.

This revision of *Coccophagus* includes a key to the species and redescriptions of many of them. Of the species described in this genus by Girault and Dodd, 24 are referred to *Prospaltella*. The new species dealt with include: *C. timberlakei* parasitic on *Pulvinaria bigeloviae*, Ckll., in Utah; *C. lepidus* possibly parasitic on *Baccacoccus*, *C. mariformis* on *Baccacoccus*, *C. flaviceps* on *Ceroplastes destructor*, Newst., *C. specialis* on *Saissetia oleae*, Bern., *C. pulvinariae* on *Pulvinaria merwei*, Joubert, *Coccus hesperidum*, L., *P. jacksoni*, Newst., and *Inglisia* sp., *C. isipingoensis* on *C. hesperidum*, *S. nigra*, Nietn., *S. persimile*, Newst., and *Filippia carissae*, Brain, *C. lutescens* on *P. jacksoni*, *C. bivittatus* on *F. carissae*, *I. elytropappi*, Brain, and *S. oleae*, *C. margaritatus* on *Ceroplastes* sp. and *Chrysomphalus* sp., *C. nigritus*, *C. spectabilis* and *C. robustus* on *S. persimile*, *C. speciosus* on *S. persimile*, *Filippia carissae* and *Coccus hesperidum*, and *C. clavellatus* on *Ceroplastes destructor* and *Coccus hesperidum*, all in South Africa; *C. tarongaensis* on *Inglisia* sp., and *C. gregarius* on *Eriococcus* sp., in New South Wales; *C. cubaensis* on *Pulvinaria* sp. in Cuba; *C. tibialis* on *S. oleae*, *S. coffeae*, Wlk. (*hemisphaerica*, Targ.) and *Coccus viridis*, Green, in the Philippines; *C. ishii* on *Lecanium* (*Eulecanium*) sp. and *P. camelicola*, Sign., in Japan; and *C. silvestrii* on *Lecanium* sp. in China. *C. modestus* var. *capensis*, n., is recorded from *S. oleae* and *S. persimile* in South Africa.

Carter (W.). **Ecological Studies of the Beet Leaf Hopper.**—*Tech. Bull. U.S. Dept. Agric.*, no. 206, 114 pp., 8 pls., 34 figs., 32 refs. Washington, D.C., November 1930.

In view of the increasing importance to the sugar industry of the United States of outbreaks of *Eutettix tenella*, Baker, the vector of curly-top of sugar-beets, a detailed study of the insect was begun in 1925 in an endeavour to establish a basis for predicting outbreaks, by using ecological methods and technique. The investigations were carried out in a permanent breeding ground in southern Idaho, and the ecology of *E. tenella* was studied in its native desert environment and in the beet fields. The data obtained on such subjects as the physical factors

of the environment and the relations between *E. tenella* and its food-plants, the insect community, and the winter environment and hibernation are given in detail, and their application to the prediction of outbreaks, the distribution of the leafhopper and the probable limits of its economic spread are discussed at length. The measurement and significance to entomology of the environmental complex is also dealt with.

Headlee (T. J.). **The primary Insect Problems of the Fruit Grower in the Season of 1930.**—*Proc. N. J. St. Hort. Soc. 1929*, pp. 36–44. Union Hill, N.J. [1929]. [Recd. March 1931.]

Suggestions are made for the combined control of European red mite [*Paratetranychus pilosus*, C. & F.] and Aphids [*Aphis pomi*, DeG., and *Anuraphis roseus*, Baker] on apple in New Jersey, for which no single spray combination has yet been devised. The overwintering eggs of *Paratetranychus* can be destroyed by a proper combination of Bordeaux mixture and oil emulsion, which would also afford protection against apple scab, and nicotine added to this mixture might possibly destroy the winter eggs of the Aphids. If an oil-soluble fungicide such as copper oleate were added to the oil component of a spray that also contained cresylic acid, the oil would destroy the eggs of the red mite, the cresylic acid those of the Aphids [*R.A.E.*, A, xix, 168], and probably the copper oleate the fungus. Where apple scab is negligible, a combination consisting of 4½ gals. oil emulsion to 95½ gals. water with the addition ½ gal. of 95 per cent. cresylic acid should be applied to the trees during the delayed dormant period. The reinfestation of *A. pomi*, which is liable to occur in June, may be controlled by a spray of nicotine and potassium oleate.

The use of pineole soluble [xvii, 669] for destroying the overwintering larvae of the codling moth [*Cydia pomonella*, L.] is only recommended where the moth is very abundant or extremely difficult to control, as it is not yet known to what extent the dormant buds can withstand this treatment.

The information given concerning the use of fish oil as an adhesive and spreader for orchard sprays and on the leopard moth [*Zeuzera pyrina*, L.] as an apple pest has already been noticed [xvii, 374 ; xix, 168].

Grape leafhoppers [*Erythroneura*] may be controlled by one application, mainly to the lower surfaces of the leaves, of a spray consisting of nicotine and soap at the moment when the first brood leafhoppers show well-developed wing pads.

The Argentine Ant Situation in Mississippi.—*Quart. Bull. Mississippi Pl. Bd.*, x, no. 3, pp. 1–9, 1 map. A. & M. College, Miss., October 1930.

An account is given of the cost and results of campaigns carried out in the autumn and winter of 1929 in various parts of Mississippi against the Argentine ant, *Iridomyrmex humilis*, Mayr. The work was almost entirely based on the use of poison [*R.A.E.*, A, viii, 285], and 100 per cent. control was reported from 113 places, the average for all of the campaigns being 99·75 per cent. The necessity of extending the scheme of eradication to the entire State is again emphasised [xvii, 524].

The Vegetable Weevil.—*Quart. Bull. Mississippi Pl. Bd.*, x, no. 3, pp. 11–13. A. & M. College, Miss., October 1930.

Listroderes obliquus, Gyll., often causes serious damage to vegetables, particularly turnips, in southern Mississippi. Brief notes are given on its bionomics [*cf. R.A.E.*, A, xvi, 257]. Arsenical sprays or dusts have proved more satisfactory than poison baits in Mississippi. A thorough application of lead or calcium arsenate at the rate of 2 lb. to 50 U.S. gals. water has given good results. Where turnips are grown for the purpose of canning the tops, the spray should be applied just after the tops are removed, to protect the new growth.

Cole, Jr. (A. C.). **Typha Insects and their Parasites.**—*Ent. News*, xlii, nos. 1–2, pp. 6–11, 35–39, 13 refs. Philadelphia, Pa., January-February 1931.

A list is given of the insects found infesting *Typha* in various parts of the United States, with brief notes on their bionomics and parasites. The latter included *Macrocentrus ancylivora*, Roh., from pupae of *Arsilonche albovenosa*, Goeze, in Michigan, and *Muscina stabulans*, Fall. [*R.A.E.*, A, xviii, 418] and *Ceromasia* (*Masicera*) *senilis*, Mg., from *Archanara subcarnea*, Kell., both in Michigan and Ohio.

Brower (A. E.). **Recapture of marked Cutworm Moths in a Trap Lantern (Lep.: Noctuidae).**—*Ent. News*, xlii, no. 2, pp. 44–46. Philadelphia, Pa., February 1931.

Following previous work [*R.A.E.*, A, xviii, 418], preliminary experiments were carried out in New York in 1930 to determine the feasibility of obtaining data upon the movement of Noctuids attracted to light. A total of 1,000 marked cutworm moths of various species was liberated within a radius of three-eights of a mile from a trap lantern ; of these, 51 were subsequently caught in the trap, 10 after a period of 8–12 days. In a number of the cases, buildings and electric lights intervened between the point of release and the trap lantern.

Stewart (F. C.) & Glasgow (H.). **Aphids as Vectors of Leaf Roll among sprouting Potato Tubers.**—*Tech. Bull. New York St. Agric. Expt. Sta.*, no. 171, 21 pp., 6 figs., 9 refs. Geneva, N.Y., December 1930. Abstract in *Phytopathology*, xxi, no. 1, pp. 103–104. Lancaster, Pa., January 1931.

In 1928 and 1930, *Myzus persicae*, Sulz., was found infesting potatoes in a grocery store in Geneva, New York. The occurrence of Aphids on sprouting potato tubers is common in the British Isles, but had not been previously recorded in America. In an experiment, which is described in detail, to determine whether Aphids are capable of spreading leaf-roll among sprouting tubers, halved tubers were mixed with others infected with the disease and infested by Aphids, and were allowed to sprout for 20 days. The Aphids multiplied and spread to the sprouts of the healthy tubers. Each half-tuber was then cut crosswise in half and planted. Of the 76 plants produced, 5 appeared normal, 68 showed positive symptoms of leaf-roll, and 3 were doubtful. Under parallel conditions the other halves of the same tubers, which were not exposed to the Aphids, produced normal plants. Another experiment showed

that normal and infected plants may be obtained from different sprouts of the same tuber by allowing the Aphids to feed upon some sprouts and excluding them from others.

Aphids on seed potatoes may be killed without injury to the tubers by fumigation for 2–3 hours with tobacco dust of a high nicotine content or sodium cyanide, used at the rate of 1 oz. or ½ oz. respectively to 1,000 cu. ft. of space.

Richards (B. L.). **Further Studies with Psyllid Yellows of the Potato.** (Abstract.)—*Phytopathology*, xxi, no. 1, p. 103. Lancaster, Pa., January 1931.

In repeated tests, adults of *Paratrioza cockerelli*, Sulc, used in numbers of up to 1,000 individuals to a plant, failed to produce psyllid yellows on potato [*cf. R.A.E.*, A, xvii, 281]. Nymphs produced by adults used in such tests, as well as those from all other sources employed, when used in sufficient numbers, produced the disease uniformly. All attempts to separate nymphs from the infective principle by rearing young nymphs on healthy plants from eggs hatched on healthy leaves in Petri dishes have failed. The type of symptoms and the degree of injury to the potato appear to be definitely correlated with the number of nymphs feeding, length of feeding period, and the intensity and duration of light exposure. Under greenhouse conditions the disease is not induced uniformly with fewer than 15 nymphs. With larger numbers, symptoms appear in from 4 to 6 days. The progress of the disease is interrupted, and the plant apparently may assume a normal character, if the feeding nymphs are removed from the infested plant in 5 to 10 days after the appearance of the first symptoms. Growth, which is stimulated by insect feeding, but which occurs after their removal, is to all appearances normal. In Utah, normal plants are obtained from tubers grown from infested plants.

Lefebvre (C. L.). **A destructive fungous Disease of the Corn Borer.** (Abstract.)—*Phytopathology*, xxi, no. 1, pp. 124–125. Lancaster, Pa., January 1931.

An outbreak of *Beauveria bassiana* on the larvae of the corn borer [*Pyrausta nubilalis*, Hb.] is reported from laboratories in Massachusetts, mortality being as high as 90 per cent. among larvae imported from Manchuria. This is probably the first record of this fungus on *P. nubilalis* in the United States. In experiments, all larvae inoculated with conidia died within two days, whereas in tests with *B. globulifera*, only 4 larvae were killed in seven trials with 10 larvae to each test. Preliminary tests, in which spores of *B. bassiana* were dusted over fields infested by the corn borer, indicate that at least a partial control can be obtained. The characters of the two fungi on culture media are indicated, as well as the appearance of larvae killed by *B. bassiana*.

McGregor (E. A.). **A new Spinning Mite attacking** *Asparagus plumosus* **in Florida.**—*Proc. Ent. Soc. Wash.*, xxxii, no. 9, pp. 161–163, 6 figs. Washington, D.C., December 1930.

A description is given of *Divarinychus floridensis*, gen. et sp. n., which caused serious injury to *Asparagus plumosus* in two localities in Florida, the more tender growth and young shoots being particularly subject to infestation.

MOZNETTE (G. F.), BISSELL (T. L.) & ADAIR (H. S.). **Insects of the Pecan and how to combat them.**—*Fmrs.' Bull. U.S. Dept. Agric.*, no. 1654, 59 pp., 72 figs. Washington, D.C., January 1931.

This revision of a previous bulletin [*R.A.E.*, A, xii, 324] includes a spray programme for combating insect pests and diseases of pecan in the United States.

WATSON (J. R.). **[Report of the Department of] Entomology.**—*Rep. Florida Agric. Expt. Sta. 1928–29*, pp. 53–58. [Gainesville, Fla., 1930.]

Brief notes are given on the progress of work on several of the pests mentioned in the previous year's report [*R.A.E.*, A, xviii, 246]. The velvet bean caterpillar [*Anticarsia gemmatalis*, Hb.] caused extensive damage to peanuts [*Arachis hypogaea*] in the Everglades. The fact that the moths oviposited on peanuts is thought to be due to the absence of other food-plants. As arsenicals are injurious to Everglade soils, calcium fluosilicate was used with more or less satisfactory results. The general absence of birds contributed to the increase of this pest, and the planting of shrubs has been recommended to attract them. *A. gemmatalis* was also destructive to soy beans [*Glycine hispida*] during the summer ; early planting appears to be the only method of avoiding injury. In experiments against *Empoasca fabae*, Harr., on beans, sprays were found to be of more value than dusts ; a pyrethrum spray combined with soap killed all the leafhoppers hit by it.

Further investigations on *Nezara viridula*, L. [*loc. cit.*] confirmed the observation that a mixture of beggarweed [*Meibomia*] and *Crotalaria* is a dangerous combination in a citrus grove, as the bugs breed on the beggarweed and migrate to the *Crotalaria* in sufficient numbers to destroy the pods, which may result in a second migration to *Citrus*. In many groves where *Crotalaria* is grown, however, they are scarce, owing to the presence of parasites, particularly the Tachinid, *Trichopoda pennipes*, F. The abundance of *N. viridula* can be predicted a month before the dangerous period (November) by observing the percentage of parasitism in September and October. The egg parasite, *Telenomus megacephalus*, Ashm., was not common. It was found during studies on *Aphis spiraecola*, Patch (green citrus aphids) that if the mean temperature during January is above 60° F., outbreaks are apt to occur in the following spring, although they may be inhibited by severe frost or heavy rain. Predators were more efficient in delaying attacks than in previous years. Destruction of the Aphids on young trees in the winter, particularly in January, together with cultivation and fertilisation to accelerate spring growth, was shown to be effective in preventing outbreaks.

WILCOXON (F.) & HARTZELL (A.). **Some Factors affecting the Efficiency of Contact Insecticides. i. Surface Forces as related to Wetting and tracheal Penetration.**—*Contr. Boyce Thompson Inst.*, iii, no. 3, reprint 13 pp., 4 figs., 16 refs. Yonkers, N.Y., January 1931.

The following is largely taken from the authors' summary : Literature on the part played by surface forces in determining the efficiency of contact insecticides is discussed. Preliminary observations showed

that many spray solutions wet poorly and do not spread over the insect and form a film unless a suitable spreading agent is present. Aqueous spray solutions did not penetrate the tracheal system of the larva of *Protoparce* (*Phlegethontius*) *quinquemaculata*, Haw., without a wetting agent ; among such agents soaps were found to be the best. Even with soap, the solution did not penetrate the tracheal system of a dead larva, indicating the need of respiratory movements or at least vital activity for penetration to take place. The angle of contact exhibited by soap solutions within the tracheae also indicates that the capillary forces involved cannot account for penetration. The toxicity to *Aphis rumicis*, L., of nicotine solutions alone or containing calcium caseinate, penetrol or sodium oleate was determined and compared with measurements of surface tension and angle of contact. It was found that the toxicity followed the same order as the spreading coefficient.

Patton (W. S.). **Insects, Ticks, Mites and Venomous Animals of Medical and Veterinary Importance. Part II.—Public Health.**—Med. 8vo, viii+740 pp., 57 pls., 388 figs., 1 chart. Liverpool School of Tropical Medicine, 1931. Price 22*s*. 6*d*.

This volume, of which a more detailed description is given elsewhere [*R.A.E.*, B, xix, 101], contains a very full account on pp. 368–708 of a great range of household Arthropods and their control, including those infesting furniture, timber, stored products, books, clothing, etc. Many useful keys are included, and the work is therefore of considerable interest to workers in a wider field than that of medical entomology.

Uvarov (B. P.). **Insects and Climate.**—*Trans. Ent. Soc. London*, lxxix, pt. 1, pp. 1–247, 53 figs., 40 tables. London, April 1931. Price 21*s*.

This important review of the literature on the subject, which has been published by the Entomological Society of London with the assistance of the Empire Marketing Board, should be consulted in the original. It is divided into two main parts. The first deals with "The Physical Factors of Insect Life" and comprises sections on heat, humidity, other climatic factors and combinations of several factors. The second and larger portion is entitled "Weather, Climate and Insects" and deals with the following aspects of this problem: Relation of Weather to the Activities of Insects ; Daily and Annual Cycles ; Climate and Distribution ; Effect of Climate on Abundance ; and Climate and Weather in Economic Entomology. There is a very extensive and useful bibliography of over 1,150 titles, and an index to authors and a subject index are appended.

Flint (W. P.) & Mohr (C. O.). **New Protection against Stored-grain Insects.**—*Bull. Illinois Agric. Expt. Sta.*, no. 359, pp. 375–390, 6 figs. Urbana, Ill., November 1930.

As a result of five years' experiments, some of the oil emulsions and miscible oils used for spraying fruit trees have been found to protect stored maize from insect attack without affecting germination. Each material was tested with 5–10 ears, which were dipped into the mixture and then placed on flat screen-bottomed trays in rooms where they were exposed to attack for 5 months or longer by numbers of the

Angoumois grain moth [*Sitotroga cerealella*, Ol.], Indian meal moth [*Plodia interpunctella*, Hb.], granary weevil [*Calandra granaria*, L.], rice weevil [*C. oryzae*, L.], confused flour beetle [*Tribolium confusum*, Duv.] and saw-toothed grain beetle [*Silvanus surinamensis*, L.]. The temperature was 75–85° F., with a humidity of about 40–50 per cent. Untreated ears were similarly exposed as controls. At various times during the experiments grains were removed for tests on germination. Treatments that gave excellent results, protecting 80 per cent. or more of the maize, without affecting germination, were Volck (1 : 10), lubricating oil emulsion (1 : 8 and 1 : 10) and a commercial oil (1 : 10 and 1 : 12). Preliminary feeding tests appear to indicate that the treated maize can be used as food for animals. The stock lubricating oil emulsion is prepared by boiling together for 5 minutes 1 U.S. quart water, 1–2 lb. potassium oleate (the quantity depending on the hardness of the water) and 1 U.S. gal. light-grade lubricating oil, the specification of which is given. The maize is placed in baskets or, preferably, slatted crates ; these are dipped in a tub or small tank containing the liquid and then removed immediately and placed on a draining board, to permit the excess liquid to run back to the tank. The maize should be thoroughly dried and stored with as little handling as possible, as it is apparently the thin film of oil surrounding each seed that protects it from insect injury.

Summary for 1930.—*Insect Pest Surv. Bull.*, x, no. 10, pp. 437–467, 10 maps, multigraph. Washington, D.C., U.S. Dept. Agric., Bur. Ent., 1930.

Many of the insects dealt with in this review have been noticed from other sources. Maps are given to illustrate the present situation with regard to such important pests as *Pyrausta nubilalis*, Hb., the numbers of which show an average reduction of 25 per cent. compared with the figures for 1929 ; *Hypera variabilis*, Hbst. (*Phytonomus posticus*, Gyll.), which is so largely influenced by meteorological conditions that the effect of an apparently overwhelming percentage of parasitism may be offset by favourable weather ; *Cydia* (*Laspeyresia*) *molesta*, Busck, which was on the whole less injurious than in 1929 ; *Popillia japonica*, Newm., which now covers an area of 25,592 square miles ; *Epilachna corrupta*, Muls. ; *Listroderes obliquus*, Gyll., which did serious damage to tomatos, turnips and carrots and is still spreading both eastward and westward ; *Platyedra* (*Pectinophora*) *gossypiella*, Saund. ; *Tibicen* (*Tibicina*) *septemdecim*, L. ; and *Stilpnotia salicis*, L. The wireworm, *Heteroderes laurenti*, Guér., first found in the United States in 1927, has become very abundant in parts of the Gulf Coast States. *Alabama argillacea*, Hb., is estimated to have destroyed 30 per cent. of the cotton crop in Arizona. *Hellula undalis*, F. (cabbage webworm) destroyed several hundred acres of turnips in Mississippi. Outbreaks are also recorded of *Heterocampa guttivitta*, Wlk., which defoliated large areas of beech and maple, and *Dendroctonus frontalis*, Zimm., and *D. monticolae*, Hopk., on pines. *Phloeosinus cristatus*, Lec., has caused much damage to cypress trees in California and Arizona ; numerous hedges and windbreaks were killed and ornamental trees injured by its twig-pruning habits. *Toumeyella numismatica*, Pettit & McD., was injurious for the first time in the forests of Wisconsin, especially on Jack pine [*Pinus banksiana*]. A small Cydnid, *Pangaeus uhleri*, Sign.,

attacked spinach in Virginia, killing the young plants before they pushed through the soil so that 43 acres had to be resown. A heavy outbreak of *Diapheromera femorata*, Say, in Connecticut, resulting in some defoliation, occurred on oaks and certain pines.

HEADLEE (T. J.). **A five-year co-operative Campaign against the Codling Moth.**—*Trans. Peninsula Hort. Soc.*, 1930, pp. 52–59. Dover, Del. [1931.]

The situation with regard to the codling moth [*Cydia pomonella*, L.] on apple in New Jersey, and various factors influencing its incidence in the field are briefly reviewed. The methods employed in its control during 1925–30 are outlined, and a table showing the seasonal variations in its activities as compared with the spraying programme is given. Spraying experiments with a pyrethrum white oil and with nicotine tannate, which were tested as substitutes for sprays containing an arsenical, show that these insecticides are effective in control and avoid the necessity of washing the fruit. The cost is, however, likely to be greater than that of lead arsenate, followed by adequate washing. Tests conducted over a period of three years show that painting or spraying the rough areas of the bark of the trunks and larger branches of the trees during the dormant season with pineole soluble [*cf. R.A.E.*, A, xvii, 669] will destroy the overwintering larvae without causing any injury to the trees.

WILLIAMS (L. L.). **The Grape-berry Moth Problem during 1930.**—*Trans. Peninsula Hort. Soc.*, 1930, pp. 131–139. Dover, Del. [1931.]

An account is given of investigations, conducted chiefly during 1930, on the life-history and control of the grape-berry moth [*Polychrosis viteana*, Clem.] on vines in Delaware. Part of the second generation and all of the third overwinter in the pupal stage. Tables are given showing the seasonal life-history and progress in development of infestation. In the standard spray programme, which includes 5 applications, the last 3 of which contained lead arsenate, the addition of fish-oil to the third and fourth (pre- and post-blossom) sprays resulted in a considerable increase in efficiency of the spray ; the addition of 40 per cent. nicotine sulphate, 1 : 800, to the last (10-day) application resulted in an even greater efficiency. Further tests showed that lead arsenate is most effective when included in the 10-day spray, which is at present the last applied before the eggs of the first generation begin to hatch. The spraying programme recommended for 1931 should include lead arsenate at the rate of 4 lb. to 100 U.S. gals., and fish-oil at the rate of 4 oz. by weight to each lb. of insoluble material, in the 10-day, pre-blossom and post-blossom sprays. Nicotine sulphate should be included in the 10-day spray, since it is effective against both *P. viteana* and the grape leafhopper [*Erythroneura comes*, Say].

SANDERS (P. D.) & LANGFORD (G. S.). **Observations on the Mexican Bean Beetle and the Potato Tuber Moth.**—*Trans. Peninsula Hort. Soc.*, 1930, pp. 168–171. Dover, Del. [1931.]

The hot weather and drought of the 1930 season were very unfavourable to *Epilachna corrupta*, Muls., on beans in Maryland. Although a large number of beetles emerged from hibernation, development was

subsequently retarded, the immature stages being killed in many instances, as were adults that fell on to the hot soil. These conditions were apparently favourable, however, to *Phthorimaea operculella*, Zell., which was widely distributed on potatoes. A survey in the autumn showed that in fields where control measures had been omitted, 10 to 34 per cent. of the tubers were infested.

Experiments in 1929 and 1930, in which a number of insecticides were tested against *E. corrupta* on beans, are described. The dusts were applied at the rate of 20 lb., and the sprays at 100 U.S. gals., to the acre. In general the sprays gave better control, owing apparently to their greater adhesive qualities and the ease with which they can be applied to the lower surface of the leaves where the insects feed. Calcium arsenate when used with lime as a dust or spray caused injury to the foliage, but when used as a dust with monohydrated copper sulphate and hydrated lime (20 : 20 : 60) gave promising results. Apart from acting as a combined fungicide and insecticide, this dust can be safely used on a large variety of crops. Magnesium arsenate gave excellent control without injuring the foliage and mixed well with Bordeaux mixture. A 20 : 20 : 60 magnesium arsenate copper sulphate and lime dust also gave excellent control. Barium fluosilicate, 1 lb. to 50 U.S. gals. water, gave good control and did not injure the plants; as a dust, however, it caused discolouration on the foliage. Potassium hexa-fluoaluminate (K_3AlF_6), tested in 1930, gave excellent control, mixed well with Bordeaux mixture, and under the weather conditions of the season did not injure the foliage.

Observations on *P. operculella* [*R.A.E.*, A, xvii, 197] show that development may continue in potatoes in storage, if conditions are favourable. Ridging, provided that it was carried out not later than 45 days after planting, reduced the average infestation of tubers from 18·2 per cent. to 5·5.

COOLEY (R. A.). **Montana Insect Pests for 1929 and 1930.**—*Bull. Montana Agric. Expt. Sta.*, no. 238, 23 pp. Bozeman, Mta., December 1930.

Brief reference is made to the organisation of the entomological services in Montana. Grasshoppers abundant in 1930 were *Camnula pellucida*, Scudd., *Melanoplus femur-rubrum*, DeG., and *M. bivittatus*, Say. These may be expected to cause trouble in 1931, and prompt control measures should be undertaken locally to prevent further increase. *Corymbites* (*Ludius*) *aeripennis*, Kby. and *C.* (*L.*) *inflatus*, Say, were discovered in localities hitherto free from wireworms, and in such numbers that winter wheat fields had to be resown. *Limonius* sp. was also injurious to vegetable crops, particularly to cabbage seedlings. The cutworms, *Euxoa ochrogaster*, Gn., and *Porosagrotis orthogonia*, Morr., were abundant. The Eurytomid, *Bruchophagus funebris*, How., breeds in lucerne seeds, sometimes damaging 50–60 per cent. The adults emerge by gnawing small holes through both seed and pod about harvest-time. A second generation matures in the seed in the spring. The spread of infestation through the sale of infested seeds is common; it is essential to determine whether the practice of cutting the crop before the time for oviposition, as followed in Canada, would be effective in Montana. Against *Eriosoma* (*Schizoneura*) *lanigerum*, Hausm., which is particularly

injurious on apple in the Bitter Root Valley, the parasite, *Aphelinus mali*, Hald., is to be introduced. Other troublesome pests included *Plutella maculipennis*, Curt., on mustard crops grown for seed, and *Erythroneura ziczac*, Walsh, on Virginia creeper [*Parthenocissus quinquefolia*]. A list of insects reported during 1929 and 1930 is appended.

HOGGAN (I. A.). **Further Studies on Aphid Transmission of Plant Viruses.**—*Phytopathology*, xxi, no. 2, pp. 199–212, 2 figs., 7 refs. Lancaster, Pa., February 1931.

An account is given of experiments on transmission of various mosaic diseases to tobacco by Aphids [*R.A.E.*, A, xviii, 417, etc.]. Though *Myzus solani*, Kalt. (*pseudosolani*, Theo.), *Macrosiphum gei*, Koch (*solanifolii*, Ashm.) and *Myzus circumflexus*, Buckt., appear unable to transmit the ordinary tobacco mosaic virus from tobacco, they will transmit it from tomato, *M. solani* causing very high percentages of infection. Evidence has been obtained to indicate that *Myzus persicae*, Sulz., on the other hand, does not transmit this virus from tomato, or only on very rare occasions. Transmission of tobacco-mosaic virus by *M. solani* was demonstrated from six different varieties of tomato, whereas from four other plants in addition to tobacco no transmission was obtained. From *Solanum nigrum* there was evidence of occasional transmission. *M. solani* was also shown to transmit a form of yellow tobacco mosaic from tomato but not from tobacco. The evidence hitherto obtained indicates that although Aphids are unlikely to be responsible for any dissemination of ordinary tobacco mosaic so far as transmission from tobacco is concerned, they may play an important part in the dissemination of this disease on tomatos, or from tomato to tobacco where these two crops are grown in close proximity. The failure of *M. solani* to transmit the tobacco mosaic from tobacco may be explained by the assumption that the Aphid does not extract the virus from those tissues of the tobacco plant on which it feeds.

BONDAR (G.). **Insectos damninhos e molestias da batata doce no Brasil.** [Insect Pests and Diseases of the Sweet Potato in Brazil.] —*O Campo*, i, no. 11, pp. 33–35, 9 figs., no. 12, pp. 19–20, 5 figs. Rio de Janeiro, November-December 1930.

The first of these parts of a continued paper on pests of sweet potato in Brazil [*cf. R.A.E.*, A, xix, 14] deals with Coleoptera, including a number of Chrysomelids [*sens. lat.*], of which the Eumolpid, *Typophorus versutus*, Lef., is very harmful, the larvae mining in the tubers, and the weevil, *Euscepes batatae*, Waterh., which is the most serious pest of the plant. *Cylas formicarius*, F., has not been found in Brazil. In the second part, notes are given on the Pyralid, *Megastes pucialis*, Sn., which mines in the tubers.

Uma abelha prejudicial ás plantas. [A Bee harmful to Plants.]—*O Campo*, i, no. 11, p. 48, 1 fig. Rio de Janeiro, November 1930.

The bee, *Melipona argentata*, Lep., is a serious pest of roses, *Camellia* and *Citrus* in Brazil, owing to its marked preference for the flower-buds. The nests should be soaked with kerosene and burnt.

MASSEE (A. M.). **The relative Value of Tar-distillate Washes, Spring Washes and Grease-banding in any Scheme of Insect Control.**—*J. Kent Fmrs.' Un.*, xxviii, no. 3, pp. 98–104. Maidstone, September 1930. [Recd. 1931.]

Lists are given of pests of orchards and bush-fruits in Britain that are controlled by standard tar-distillate washes, those that are partly controlled and those that are unaffected. The most economical strength of spray and the critical time for applying the wash to various kinds of fruits are discussed. Cases in which it is also desirable to apply other insecticide sprays in spring and to use adhesive bands are indicated.

HUGHES (A. W. McK.). **Aphides as Vectors of "Breaking" in Tulips.**—*Ann. Appl. Biol.*, xviii, no. 1, pp. 16–29, 1 pl., 2 refs. Cambridge, February 1931.

Further and more extensive experiments [*cf. R.A.E.*, A, xviii, 331], which are described in detail, were carried out in 1929–30 with *Myzus persicae*, Sulz., and *Macrosiphum gei*, Koch, as vectors of the virus causing "breaking" in tulips. They indicate that "red break" and "white break" are transmitted equally by the two species [*cf. loc. cit.*], and that the virus can be transmitted from some varieties of tulips more readily than from others. Some evidence was obtained that red break is an earlier stage in the development of the virus and that white break is the final stage. Mass infection in the open gave a lower percentage of break than individual infection under glasshouse conditions. There is as yet no indication that "parrot" disease (characterised by curled and laciniated petals in which are inclusions of green tissue) is transmissible by these Aphids.

NELSON (A.). **Pasture Production in Areas liable to Infection by *Oncopera intricata* (Walker) in Tasmania.**—*Ann. Appl. Biol.*, xviii, no. 1, pp. 54–59, 1 ref. Cambridge, February 1931.

The problem of pasture production in Tasmania is an important one, and the Hepialid, *Oncopera intricata*, Wlk., is highly injurious in the grazing lands [*cf. R.A.E.*, A, xvii, 533]. Replies received to a questionnaire show its occurrence to be practically ubiquitous and the injury to be severe in almost all localities. Damage is most frequently observed from August to the end of the year, though it sometimes appears in July, or may not be noticeable until January. The larvae are generally active for from 2 to 4 months, during the period of greatest growth of the grass. English rye-grass [*Lolium perenne*] seems to suffer the most; clover is seldom found to be attacked. Hilly land seems to be more affected than flat. Conditions favourable to infestation are a dry winter and spring, good growth of grass in the previous season, old grass left in autumn, and newly opened-up country. The control measures practised include flooding irrigable land, close-grazing, top-dressing, light harrowing to expose the larvae to birds, and the encouragement of the latter, especially plovers and starlings. The evidence indicates that a sward of creeping grasses and clovers would be the most profitable.

Barnes (H. F.). **Further Results of an Investigation into the Resistance of Basket Willows to Button Gall Formation.**—*Ann. Appl. Biol.*, xviii, no. 1, pp. 75–82, 2 pls., 3 refs. Cambridge, February 1931.

Further experiments in England on the susceptibility of basket willows to gall formation due to the attacks of *Rhabdophaga heterobia*, H. Lw. [*cf. R.A.E.*, A, xviii, 668] are here described. Twelve commercial varieties of *Salix triandra* were very susceptible to attack. Three varieties of *S. purpurea*, one of *S. viminalis* and three hybrids of *S. viminalis* and *purpurea*, as well as *S. alba* var. *vitellina*, have proved to be quite immune ; eggs may be deposited and larvae hatch on these, but no galls nor side-branching have been produced. A closely allied gall-midge, *R. terminalis*, H. Lw., attacks *S. alba* var. *vitellina*, but has not been known to attack any variety of *S. triandra*. Similar food-plant preferences among willows occur in *Galerucella lineola*, F., and *Phyllodecta* spp. [xviii, 230]. It is suggested that hybridisation of *S. triandra* with *S. purpurea*, *S. viminalis* or *S. alba* should be attempted.

Bovien (P.). **Paeregalmyggen** (*Contarinia pyrivora*).—*Haven*, April 1930, reprint 3 pp., 1 fig. Copenhagen, 1930.

The life-history and control of *Contarinia pyrivora*, Riley, one of the most serious pests of pears in Denmark, are briefly discussed [*cf. R.A.E.*, A, xviii, 181]. As the eggs are invariably laid on the blossom and the flight period of the adults is very short, late blooming varieties of pear often escape attack.

Bovien (P.). **To slemme Skadedyr paa Jordbaerplanterne.** [Two serious Pests of Strawberry.]—*Haven*, June 1930, reprint 2 pp., 4 figs. Copenhagen, 1930.

A brief account is given of the bionomics and control of *Peronea* (*Acalla*) *comariana*, Zell., and *Anthonomus rubi*, Hbst., both of which cause serious injury to strawberry plants in Denmark.

Olombel (M.). **Note préliminaire sur la cécidomyie du chou-fleur** (*Contarinia torquens* **de Meij.**).—*C. R. Acad. Agric. Fr.*, xvii, no. 6, pp. 178–182, 6 refs. Paris, 1931.

Considerable injury has been caused to cauliflower in north-eastern France by *Contarinia torquens*, de Meij. Damage was also observed in 1926 in the neighbourhood of Paris on cabbage and swedes. The adults from the overwintered pupae left the ground in 1930 during the first 10 days of June, after a series of warm rain storms, and the plants showed malformation 9–11 days after being attacked. Injury increased suddenly from a single plant on 10th June to large numbers by 16th–21st. Adults of the first and second generations appeared in large numbers between 6th and 8th July and 9th and 11th August, respectively, and the larvae of the third generation entered the ground to pupate in late August and early September, although an abundance of young cauliflowers still remained and the weather in September was hotter than in July and August. Thus, injury is only caused between June and August. A certain amount of overlapping of the generations occurs.

Males and females appear to be about equally numerous, and females seem to be unable to reproduce parthenogenetically. The eggs, which are described, are laid in batches of 15–20 on the youngest parts of the plants, one female ovipositing several times. The larvae hatch after 3–4 days and live on any part of the plant ; mature larvae have been found in quite well developed inflorescences. The larval stage lasts about 15 days, and the pupal stage of the first two generations about 13. The larvae do not appear to gnaw the vegetable tissue, the epidermis of which often remains intact during their entire development, but it is probable that their digestive juices exercise a chemical action on the plant, which provokes the exudation of a liquid that flows over them, and on which they appear to feed, followed by the deformation of the limb, and finally a long inactivity or even the death of the terminal bud, which may subsequently be attacked by bacteria. The larvae jump to the ground to pupate, and can do so in any moist material. It is important from the point of view of outbreaks that the larvae can only live in an almost liquid medium. They succumb immediately to drought, but can live several days in water. The wettest ground, which is that most suitable for the cultivation of cauliflowers, is the most subject to attack, and the particularly wet summer of 1930 gave rise to an abnormal increase in the distribution and intensity of infestation. Cauliflowers grown on soil treated with 1,000–1,300 lb. sylvinite or 1,300 lb. paradichlorobenzene to the acre were less severely attacked.

FEYTAUD (J.). **L'*Icerya purchasi* dans le sud-ouest de la France.**—*Rev. Zool. agric.*, xxix, no. 9, pp. 133–141, 2 figs. Bordeaux, September 1930.

An account is given of the introduction of *Icerya purchasi*, Mask., into south-western France, where it was first observed at Arcachon in 1921, and its subsequent spread there on *Mimosa* and other garden shrubs. There are at present three known foci, at Bayonne, Biarritz and Anglet, but it is possible that other unrecognised centres of infestation also exist. Two colonies of *Novius* [*cardinalis*, Muls.] were established for the control of the Coccid at Biarritz in July and August 1929, and new ones in 1930, one at the same point as in 1929 and others in two fresh localities, and it is hoped by this means to check the spread of the scale.

LAFITE (C.) & CAUDRON (G.). **Un insecte inconnu qui cause de graves dégats dans les céréales d'hiver.**—*C.R. Acad. Agric. Fr.*, xvii, no. 5, pp. 164–169. Paris, February 1931. Also in *Prog. agric. vitic.*, xcv, no. 13, pp. 304–307. Montpellier, 29th March 1931.

Serious injury has been caused to winter cereals in eastern France for the past ten years by an insect that has not yet been positively identified. In a field of oats sown at the end of September 1930, damage began to appear in patches, where the plants turned yellow and were found to have been cut through just at the collar. This was at first thought to be due to frost, but in 1931 the injury became even more severe and further investigations were instituted. Larvae

obtained in the spring of 1922 were tentatively identified as those of *Hylemyia coarctata*, Fall., and moths reared from another batch a few weeks later as *Megacraspedus dolosellus*, Zell., but the larvae concerned in 1930 were those of a Chloropid of the genus *Oscinis*, Bibionids and Cecidomyiids being also present. It is probable that the attack is begun by *Oscinis* sp., and the injury aggravated by the other insects.

These attacks were observed invariably to occur where the previous crop had been overgrown with grass. The eggs are laid in spring on young shoots of grass, and the adults developing from them oviposit at the end of October on cereals that have just appeared above the ground. It would seem that the primary control measure would be the destruction of the grass, but it is not always possible to destroy it in adjacent fields, which serve as a source of reinfestation.

Delgado de Torres (D.). **Las orugas del maíz.** [Lepidopterous Pests of Maize in Spain.]—*Bol. Pat. veg. Ent. agríc.*, iv, no. 15–18, pp. 1–20, 16 figs., 17 refs. Madrid [1930].

Lepidoptera attacking maize in Spain are *Sesamia vuteria*, Stoll, *Pyrausta nubilalis*, Hb., *Laphygma* (*Caradrina*) *exigua*, Hb., *Cirphis* (*Sideridis*) *zeae*, Dup., and *Heliothis* (*Chloridea*) *obsoleta*, F.; of these the first two are the most serious pests and the last two of little importance. Galicia and the Asturias are the regions where most maize is grown, and in the former, where the author's material was chiefly obtained, *S. vuteria* predominated over *P. nubilalis*. Notes on the distribution, morphology and biology of these two moths are given, mostly from the literature. Uprooting and burning the maize stubble to destroy the overwintering larvae is an effective control. In eastern Spain *S. vuteria* has at least two generations a year. Unlike *P. nubilalis*, it is destroyed by severe frosts. *P. nubilalis* probably has two generations a year in Spain, and perhaps three in the eastern province of Malaga.

L. exigua feeds on a variety of plants, such as beet, potato, pimento, etc. Outbreaks on maize are rare, but one occurred in 1928, the larvae pupating early in August. The adults emerged three weeks later and laid eggs that produced a second generation. Hibernation occurs in the pupal stage, and in Galicia the adults appear in May. The larvae are difficult to control, as arsenical sprays can be used only when the maize plant is quite young, because it is used for fodder. Early sowing is advised, as the newly hatched larvae cannot attack plants of advanced growth.

Gómez Clemente (F.). **Esperiencias de lucha contra la** *Ceratitis capitata*, **con cazamoscas de vidrio.** [Experiments in the Control of *C. capitata* with Glass Bait-traps.]—*Bol. Pat. veg. Ent. agríc.*, iv, no. 15–18, pp. 21–38, 12 figs. Madrid [1930].

An account is given of experiments with glass bait-traps against *Ceratitis capitata*, Wied., in Valencia. Of many baits tested, the best was bran, either in the form of a fermenting mixture of bran and water or simply the water in which bran (2–2½ oz. per 35 fl. oz.) had been steeped until fermentation began. No less than 75 per cent. of the females captured had ovaries filled with eggs. The number of bees trapped was very small and was less with the bran than with vinegar.

Benlloch (M.). **Notas sobre un curculiónido perjudicial a la alfalfa** (*Phytonomus variabilis*, **Herbst**). [Notes on a Weevil harmful to Lucerne.]—*Bol. Pat. veg. Ent. agríc.*, iv, no. 15–18, pp. 39–42, 3 figs. Madrid [1930].

In some parts of Spain *Hypera* (*Phytonomus*) *variabilis*, Hbst., is as injurious to lucerne as the Chrysomelid, *Colaspidema atrum*, Ol., which is usually the most important pest of this crop in the country. A brief description of all stages is given. An outbreak observed in 1928 appears to have been brought to an end by a fungous disease. Early mowing followed by repeated raking destroys many of the weevils.

del Cañizo (J.). **Tisanópteros perjudiciales al trigo.** [Thysanoptera harmful to Wheat.]—*Bol. Pat. veg. Ent. agríc.*, iv, no. 15–18, pp. 43–48, 6 figs., 6 refs. Madrid [1930].

Haplothrips tritici, Kurdj., and *H. statices*, Hal. (*niger*, Osb.) are common on wheat in Spain, and it is probable the two other well-known wheat thrips, *H. aculeatus*, F., and *Limothrips cerealium*, Hal., also occur there. *Aeolothrips fasciatus*, L., which is thought to be predacious on *Haplothrips*, has been noticed in infested ears. The three species of *Haplothrips* are briefly described and notes are given on the biology of *H. tritici* and *H. statices* and the injury they cause. The measures advised are early sowing of varieties of wheat that develop rapidly, the use of manures that promote early unsheathing of the ears, burning the stubble immediately after harvest, and the destruction of weeds.

Quillis Perez (M.). **Los parásitos de los pulgones. Dos nuevas especies de** *Aphidius*. [The Parasites of Aphids. Two new Species of *Aphidius*.]—*Bol. Pat. veg. Ent. agríc.*, iv, no. 15–18, pp. 49–64, 9 figs. Madrid [1930].

Both sexes of *Aphidius gomezi*, sp. n., and *A. janinii*, sp. n., and the larva of the former are described from Valencia. *A. gomezi* is an important parasite of *Toxoptera aurantii*, Boy., on orange. It produces from 500 to 800 eggs and is easily reared in the laboratory. A few individuals placed in a focus of infestation suffice to destroy it, as only when food becomes scarce do the adults allow themselves to be carried by wind to other trees. Nine or ten generations occurred in *T. aurantii* up to June or early July, after which neither the parasite nor its host were observed on orange. It was found in *Aphis rumicis*, L., on beans in October and November, and after this Aphid had disappeared in February or March, in unidentified black Aphids on wild plants. *Aphidius janinii* is a parasite of an Aphid on artichoke [*Cynara*]. The offspring of a single female placed in a tube with about 200 of these Aphids numbered 160.

Delgado de Torres (D.). **Dípteros parásitos de la langosta en España.** [Diptera parasitising Locusts in Spain.]—*Bol. Pat. veg. Ent. agríc.*, iv, no. 15–18, pp. 65–68, 2 figs., 7 refs. Madrid [1930].

A list is given of the Diptera recorded as parasites of *Dociostaurus maroccanus*, Thnb., in Spain. The Bombyliid, *Cytherea infuscata*, Mg., is fairly abundant. It is closely allied to *C. obscura*, F., recorded as

an important locust parasite in Sicily and also found in Spain. In the egg-pods examined, some unparasitised eggs were always found, confirming Uvarov's view that the larva does not pass from one egg-pod to another.

Gómez Clemente (F.). **La propagación del** *Novius cardinalis* **en España.** [The Spread of *N. cardinalis* in Spain.]—*Bol. Pat. veg. Ent. agríc.*, iv, no. 15–18, pp. 69–83, 15 figs., 10 refs. Madrid [1930].

This is an account of the introduction and spread of *Novius cardinalis*, Muls., against *Icerya purchasi*, Mask., in Spain. Further insectaries are required to ensure an adequate supply of the Coccinellid.

Ridruejo (L.). **Un experiencia de lucha contra la pulguilla de la remolacha** (*Chaetocnema tibialis* **Illig.**). [An Experiment in combating the Beet Flea-beetle, *C. tibialis*.]—*Bol. Pat. veg. Ent. agríc.*, iv, no. 15–18, pp. 84–85. Madrid [1930].

As three or four applications of an arsenical insecticide are necessary to control the flea-beetle, *Chaetocnema tibialis*, Ill., on beet in Spain, the experiment was made of rolling newly germinated beet-plants with a stone roller. The increase of crop compared favourably with that obtained with an arsenical insecticide.

Benlloch (M.) & del Cañizo (J.). **Las orugas de los frutales.** [Caterpillar Pests of Orchards.]—*Bol. Pat. veg. Ent. agríc.*, iv, no. 15–18, pp. 117–126, 12 figs. Madrid [1930].

The most injurious Lepidopterous pests of orchards in Spain are *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, L.), *Malacosoma neustria*, L., *Hyponomeuta malinellus*, Zell., *H. padellus*, L., and *Aglaope infausta*, L. Very brief notes are given on their appearance and the injury they cause, together with an account of the measures advisable against them.

García López (A.). **El " pulgón " de la vid** (*Haltica ampelophaga* **Guér.**). [The Vine Flea-beetle, *H. ampelophaga*.]—*Bol. Pat. veg. Ent. agríc.*, iv, no. 15–18, pp. 145–151, 7 figs. Madrid [1930].

Notes are given on the bionomics and control of *Haltica ampelophaga*, Guér., which is a very serious pest of vines in Spain, sometimes causing crop losses of up to 50 per cent. The Pentatomid, *Zicrona coerulea*, L., is predacious on the larvae.

Gómez Clemente (F.). **La " cuca " o " gusano negro " de la alfalfa** (*Colaspidema atrum* **Olivier**). [The Lucerne Beetle, *C. atrum*.]—*Bol. Pat. veg. Ent. agríc.*, iv, no. 15–18, pp. 152–156, 3 figs. Madrid [1930].

Serious damage to the foliage of lucerne in Spain is caused by the adults and larvae of the Chrysomelid, *Colaspidema atrum*, Ol. [*cf.* *R.A.E.*, A, xiv, 116]. The adults appear in the fields in March and April, when they pair and oviposit, about 400 eggs being laid. Incubation takes 10–15 days. Pupation occurs in the soil, and though the

pupal stage only lasts about two months, the adults do not emerge until the following spring. Low temperatures and moisture destroy many pupae, and birds feed on the larvae and adults. Early mowing and subsequent raking of the fields are useful measures, especially if a trap-strip of lucerne is left in which beetles can take refuge and be destroyed later. A barrier formed by strewing powdered lime and naphthalene over a width of 6–9 ft. prevents the spread of infestation, a mixture of one part calcium cyanamide, one of ashes and two of gypsum being still more effective. Dusting the plants with powdered quicklime, ashes, etc., is especially effective against the larvae, as they secrete a viscous fluid and so become coated with the dust and suffocated. A calcium arsenate spray may be applied to poison the foliage, but care is needed to prevent danger to stock in feeding on forage so treated.

Trabajos de las Estaciones de Fitopatología agrícola en el año 1929. [Work done by the Stations of agricultural Phytopathology in Spain in 1929.]—*Bol. Pat. veg. Ent. agríc.*, iv, no. 15–18, pp. 157–220. Madrid [1930].

As in the previous year [*R.A.E.*, A, xvii, 697], brief notes are given on the pests and diseases observed by the various phytopathological stations, etc.

HENGL (F.), RECKENDORFER (P.) & BERAN (F.). **Der Arsen- und Bleigehalt von Trauben, Traubenmost und Wein als Folge der Schädlingsbekämpfung.** [The Arsenic and Lead on Grapes, in Grape Must and Wine as a Result of Control Measures.]—*Gartenbauwiss.*, iv, no. 1, pp. 38–51, 18 refs. Berlin, 1930.

In continuation of previous investigations [*R.A.E.*, A, xvii, 575], the amounts of arsenic traceable on grapes and in must following the use of lead arsenate has been tested. It is again shown that there is no danger with must and wine, but that individual grapes may harbour considerable quantities of this poison at harvest time, so that thorough washing is necessary before they can be eaten. The use of lead arsenate during the growing period of the vine is inadvisable in vineyards where the grapes are eaten or the leaves used for fodder. In the case of fruits such as apple, lead compounds should not be used more than three weeks after blossoming.

[SELIVANOVA (S. N.).] **Селиванова (С. Н.). The Meadow Moth in 1929. According to Observations in Korocha, Belgorod Region.** [*In Russian.*]—*Mater. po Izuchen. lugov. Motuil.* Loxostege sticticalis *L. v Tz. Ch. O.* [*Materials for the Study of the Meadow Moth in the central Black Soil Zone*], pp. 39–52, 3 graphs. Voronezh, Izd. Sta. Zashch. Rast. Oblzemupravl. Tz. Ch. O., 1930.

[ZHUKOVSKIĬ (A. V.).] **Жуковский (А. В.). On the Meadow Moth in the Kursk Region in 1929.** [*In Russian.*]—*Idem*, pp. 53–66, 2 figs.

These reports describe the seasonal occurrence and bionomics of *Loxostege sticticalis*, L., in two districts of the Voronezh Government in 1929, when an unusually severe outbreak occurred in the whole

Black Soil Zone in central Russia. In field experiments carried out on a small scale in August, spraying infested beet with Paris green, sodium arsenite, or barium chloride, at the rate of 1 lb. to 30, 80 and 2 gals. water respectively, killed all the larvae, except a few of those about to pupate, which did not feed. Scorching was very slight, probably because the plants were advanced in growth and the leaves were no longer tender.

[Yaroslavtzev (G. M.).] **Ярославцев (Г. М.). Einfluss des Kleeschlages in der Fruchtfolge auf die Schädlingsvermehrung.** [The Influence of Fields of Clover sown among other Crops in the Course of Crop Rotation on the Abundance of Pests. (*In Russian.*)]—*Rep. Appl. Ent.*, iv, no. 2, pp. 319–334, 24 refs. Leningrad, 1930. (With a Summary in German.)

Investigations in 1927 and 1928 in the Smolensk Government showed that fields under clover for three or more consecutive years are exceedingly favourable for Elaterids and Tipulids, as the dense covering and humidity in the upper layers of the soil encourage the development of the larvae. *Agriotes lineatus*, L., *A. obscurus*, L., *A. sputator*, L., and *Tipula paludosa*, Mg., were especially abundant. Clover fields also afforded favourable conditions for *Sitona* spp., the species present, in order of abundance, being *S. sulcifrons*, Thnb., *S. lineata*, L., *S. crinita*, Hbst., *S. flavescens*, Marsh., and *S. suturalis*, Steph.

To avoid the formation of foci of infestation, a field should only be kept under clover for two consecutive years and should be carefully ploughed in August and September to destroy the pupae of the Elaterids and prevent the oviposition of *T. paludosa*. Flax, which is usually not attacked by wireworms, should be planted in fields previously used for clover if the wireworms are present in numbers, 40–50 individuals to 10 sq. ft. in heavy and dense soil being considered a serious infestation.

[Rakhmaninov (A. N.) & Induichenko (A. L.).] **Рахманинов (А. Н.) и Индыченко (А. Л.). Beiträge zur Kenntnis der Schädlichkeit von** ***Meromyza saltatrix*** **L.** [On the Injuries caused by *M. saltatrix*. (*In Russian.*)]—*Rep. Appl. Ent.*, iv, no. 2, pp. 335–343, 3 figs., 4 refs. Leningrad, 1930. (With a Summary in German.)

About 50 per cent. of the ears of winter wheat were damaged by *Meromyza saltatrix*, L., in the Smolensk Government in 1927. Two types of injury exist, one caused to normally developed ears by young larvae from within, no signs of infestation being visible on the exterior, and the other due to attack on the ears from both within and without, young ones being destroyed before they come out of their sheaths. The plants damaged in the latter way are easily recognisable, and the injury is more important, resulting in a loss of up to 30–40 per cent. of the grain, as compared with 9 per cent. in the former case. No difference in the effect of the injury on grain production was observed in connection with various dates of sowing or different varieties of wheat, though one variety was particularly susceptible to infestation.

[RAKHMANINOV (A. N.) & VUIRZHIKOVSKAYA (A. V.).] **Рахманинов (А. Н.) и Выржиковская (А. В.). Ueber den Verborgenrüssler** *Ceuthorrhynchus syrites* **Germ., einen Schädling des Leindotters** (*Camelina sativa*). [On *Ceuthorrhynchus syrites* Germ., a Pest of *Camelina sativa*. (*In Russian.*)]—*Rep. Appl. Ent.*, iv, no. 2, pp. 345–350, 2 figs., 6 refs. Leningrad, 1930. (With a Summary in German.)

At the end of June 1928, adults of *Ceuthorrhynchus syrites*, Germ., were numerous on *Camelina sativa* in the Tambov Government, and in July the larvae damaged about 30 per cent. of the pods, each usually harbouring a single larva. About 10 per cent. of the pods were found to be infested by a Cecidomyiid, possibly *Dasyneura brassicae*, Winn., and others had already been abandoned by it. The total percentage of infestation by the two insects was estimated to be as high as 60 per cent. In 1929, *C. syrites* was recorded on *Camelina sativa* as far north as the town of Kotlas in the former Government of Vologda. In the Tambov Government, it also occurred in small numbers together with *C. assimilis*, Payk., on mustard ; the characters differentiating these two weevils are briefly discussed.

[SKRIPCHINSKIĬ (G.).] **Скрипчинский (Г.). Zur Biologie von** *Aphidius granarius* **Marsh. und** *Ephedrus plagiator* **Nees (Braconidae), Parasiten von** *Aphis padi* **L.** [Contribution to the Biology of *A. granarius*, Marsh., and *E. plagiator*, Nees, Parasites of the Aphid of the Bird Cherry and Oats, *A. infuscata*. (*In Russian.*)]—*Rev. Appl. Ent.*, iv, no. 2, pp. 351–364, 14 figs., 21 refs. Leningrad, 1930. (With a Summary in German.)

An account is given of observations in the summer of 1929 in the Leningrad Government on *Aphidius granarius*, Marsh., and *Ephedrus plagiator*, Nees, all stages of which are described. They were the chief primary parasites of *Aphis infuscata*, Koch (*padi*, auct.) on cereals. All the stages of the Aphid were attacked, but the second and third instar larvae were preferred in nature. In the second half of July the percentage of parasitism by *Aphidius* was 89 ; it fell to 64 in the first week of August, probably owing to hyperparasites, chiefly the Cynipids, *Alloxysta* sp. and *Charips* (*Allotria*) *flavicornis*, Htg., but rose again to 77 at the beginning of September. In the laboratory, the average number of eggs laid by a female of *Aphidius* was 114 as compared with 133 by *Ephedrus* ; more eggs are probably laid in nature, as dissected females contained about 200 each. At an average temperature of 17° C. [62·6° F.] and 85 per cent. relative humidity, *Aphidius* developed in 13–16 days, and *Ephedrus* in 14–17. When fed on honey, adult males of *Aphidius* lived 8–11 days, and females 9–15, the corresponding figures for *Ephedrus* being 8–15 and 13–18. The latter began to predominate at the end of July, constituting 65 per cent. of all the primary parasites reared from *A. infuscata*. Others were the Braconids, *Aphidius avenae*, Hal., and *Praon* sp. ; the Chalcid, *Pachycrepis clavata*, Wlk., and the Calliceratid, *Lygocerus testaceimanus*, Kieff., were hyperparasites. Nearly all the Aphids had been parasitised by the middle of August, and of those that appeared in September on young cereals, 77 per cent. were parasitised.

A. granarius and *E. plagiator* also infested *Aphis* (*Sitobion*) *avenae*, F., which was present in small numbers on cereals.

[MOLCHANOVA (O. P.).] **Молчанова (О. П.). Zur Biologie von** *Cothonaspis rapae*, **West., des Parasiten der Kohlfliege** (*Hylemyia brassicae* **Bouché**). [On the Biology of *C. rapae*, a Parasite of the Cabbage Fly (*Phorbia brassicae*). (*In Russian.*)]—*Rep. Appl. Ent.*, iv, no. 2, pp. 365–370, 5 figs., 13 refs. Leningrad, 1930. (With a Summary in German.)

A brief account is given of laboratory studies on the morphology and biology of *Cothonaspis rapae*, Westw., a Cynipid parasite of *Phorbia* (*Hylemyia*) *brassicae*, Bch., carried out in the Leningrad Government in August 1929. The adults and larvae are described. The rate of parasitism of the host puparia was only 2·8 per cent., whereas 3·8 per cent. were parasitised by the Staphylinid beetle, *Aleochara bilineata*, Gyll. The egg stage lasted 3–4 days, the larval about 40, the pupal 10–11, and the adult life about a month. In the laboratory, oviposition, which is described, occurred on the fourth or fifth day after the emergence of the adults, chiefly in young larvae of the host, their age varying from 4 to 10 days. Negative phototropism was not observed [*cf.* *R.A.E.*, A, xvi, 540]; on the contrary, the females readily oviposited during the day. The parasite is probably attracted by the odour of the infested cabbage, as the larvae of the host removed from the cabbage stems, or those transferred to a fresh plant, were not attacked.

[VUIRZHIKOVSKAYA (A. V.).] **Выржиковская (А. В.). Ueber die Schädigung der Riesentrepse durch** *Hylemyia villosa* **Schn.** [On the Damage caused to *Bromus inermis* by *H. villosa*. (*In Russian.*)]—*Rep. Appl. Ent.*, iv, no. 2, pp. 421–423, 1 fig., 2 refs. Leningrad, 1930. (With a Summary in German.)

Considerable damage to *Bromus inermis* in the Tambov Government was caused in May 1928 by the larvae of *Hylemyia villosa*, Schnabl, while winter rye and wheat were attacked by those of *H. coarctata*, Fall. The morphology and biology of these two species are very similar, a difference in the structure of the hind legs of the males being described. In the laboratory the adults of *H. coarctata* emerged between 20th June and 4th July, and those of *H. villosa* between 12th and 29th June. Pupation of the former species occurs in the soil, whereas the larvae of *H. villosa* pupate in the stem of the food-plant, near the root-collar. The author believes that *H. villosa* is a specific pest of *Bromus inermis* and that *H. coarctata* does not occur on this plant.

[PETRUKHA (O. I.).] **Петруха (О. И.). Rüsselkäfer** *Oxystoma pomonae* **F. als ein Schädling der Leguminosen.** [The Weevil, *Apion pomonae*, as a Pest of leguminous Plants. (*In Russian.*)]—*Rep. Appl. Ent.*, iv, no. 2, pp. 425–429, 4 figs., 4 refs. Leningrad, 1930. (With a Summary in German.)

Brief notes are given on the biology of *Apion* (*Oxystoma*) *pomonae*, F., the larvae of which infested the pods of *Vicia sativa* in several districts of the Kiev Government in 1926–29. The overwintered weevils occur in the spring on a number of wild and cultivated leguminous plants, and in June-July infest various vetches (*Vicia* spp.) and lentils (*Lens esculenta*), feeding on the young leaves and shoots. Eggs are probably laid on the young seeds through punctures made by the females in the pods, oviposition taking place at the end of June and in

the first half of July. Each larva destroys 1 or 2 seeds, and five or more larvae often occur in a pod. Some of the pods of *V. sativa* also harboured the larvae of *Tychius quinquepunctatus*, L., which, however, were not numerous; the characters distinguishing the larvae of the two species are pointed out. *Tychius* pupated in the soil, whereas *Apion* pupated in the pods, the pupal stage lasting about 2 weeks. The young adults usually appeared in the first half of August. In one locality about 94 per cent. of the larvae were killed by an unidentified parasite.

[Karpova (A. I.).] **Карпова (А. И.). Beitrag zur Kenntnis von** *Amaurosoma flavipes* **Fall. und** *Am. armillatum* **Zett.** [On the Ear Flies, *A. flavipes* and *A. armillatum*. (*In Russian.*)]—*Rev. Appl. Ent.*, iv, no. 2, pp. 431–449, 8 figs., 14 refs. Leningrad, 1930. (With a Summary in German.)

Observations were carried out in 1928 and 1929 in the Leningrad and Smolensk Governments on *Amaurosoma flavipes*, Fall., and *A. armillatum*, Zett., which caused considerable damage to winter rye and timothy grass [*Phleum pratense*]. These Cordylurids are practically indistinguishable in the younger stages; a general description of all stages is given, and the characters differentiating the adults are indicated. There is one generation a year. The flies emerge from overwintered pupae early in the spring and under normal weather conditions complete their flight and oviposition by the end of May, though if it is cold and wet, the flight period may last till mid-June. Eggs are deposited singly on the upper surface of the leaves of rye and timothy grass. The larval stage lasts 15–17 days; most of this period is spent in the sheaths of the leaves, the larvae migrating to the ears when these are fully developed. Low temperature does not retard the hatching or development of the larvae. Pupation occurs in the soil, the pupae hibernating.

The character of the damage caused is discussed in detail. Laboratory investigations showed that the feeding of the larvae considerably decreases the weight and length of the ears and prevents the normal growth of the uppermost internode of the stem, especially in rye. In 1928 and 1929 the loss to the ultimate crop of seed of timothy grass and rye averaged 10 and 5 per cent. respectively.

[Kreĭter (E. A.).] **Крейтер (Е. А.). Experimente und Beobachtungen über den Einfluss der Temperatur auf die Entwicklung und das Benehmen (Behaviour) der Fritfliege.** [Observations and Experiments on the Influence of Temperature on the Development and Behaviour of the Frit Fly. (*In Russian.*)]—*Rev. Appl. Ent.*, iv, no. 2, pp. 451–470, 5 figs., 15 refs. Leningrad, 1930. (With a Summary in German.)

This is a detailed account of laboratory and field observations carried out in the Leningrad Government from 1923 to 1929 on the effect of temperature on the development of *Oscinella* (*Oscinosoma*) *frit*, L., the results being given in graphs and tables.

The duration of the larval stage varied from 7 days at 36° C. [96·8° F.] to 35 at 13° C. [55·4° F.]. At 6° C. [42·8° F.] the larvae become completely inactive, but resume activity at 7–12° C. [44·6–53·6° F.]; temperatures of 12° C. upwards are essential before they can feed. In nature the reactivation of the larvae begins after the cessation

of frosts at night in the spring, the average temperature of the air being 11° C. [51·8° F.] and that of the soil a little higher. Pupation does not occur below 12° C., 14° [57·2° F.] being the most favourable temperature; the larvae that possess a fat-body pupate at lower temperatures than those that require supplementary feeding. The pupal stage may last from 7 days at a temperature of 36° C. to 29 days at 13. In experiments with fluctuating temperatures (warm by day and considerably colder at night), the pupal stage lasted 1 to 3 days less than at a constant average low temperature. Some of the pupae were able to resist low temperatures, 30 per cent. of those under experiments giving rise to adults at −21° C. [−5·8° F.]. In the Leningrad Government the adults may appear about 10–25 days after the cessation of the spring night frosts. In the laboratory the adult flies lived from 8 days at 40° C. [104° F.] to 125 days at 4° C. [39·2° F.]. The females require 10–50 days to develop the ovaries; in the insectary the flies readily fed on sugar and flowers, while those that were deprived of food died in 2–3 days, which tends to indicate that in the field it is essential for the adults to feed on flowers. They prefer warm sheltered places covered with low vegetation. Pairing and oviposition occur at temperatures not lower than 12° C., the optimum being 15° C. [59° F.]. Temperatures as high as 36, 38 and 40° C. [96·8, 100·4 and 104° F.], at a 20 and 30 per cent. relative humidity, shorten the life of the flies, decrease the rate of oviposition and kill a considerable number of eggs.

In the Leningrad Government and other northern districts of the Russian Union, *O. frit* hibernates in the larval stage, as owing to the fall of temperature in the autumn the larvae cannot complete their feeding on the winter crops, which are usually sown between the 20th August and 20th September, and therefore cannot pupate. They enter hibernation at 6° C.

Kozlova (M. Ya.).] **Козлова (М. Я.). Zur Kenntnis der Widerstandsfähigkeitfaktoren einiger Gerstensorten gegen die Fritfliege.** [The Question of the Factors of Resistance of certain Varieties of Barley to the Frit Fly. (*In Russian.*)]—*Rep. Appl. Ent.*, iv, no. 2, pp. 483–498, 7 figs., 7 refs. Leningrad, 1930. (With a Summary in German.)

This is an account of field observations carried out in the years 1923–29 in the Leningrad Government on the resistance of different varieties of barley to *Oscinella* (*Oscinosoma*) *frit*, L. It was found that infested plants tiller more profusely than uninfested ones and that the economic importance of these additional stems depends on the degree of their development at the time of harvest. Special attention was devoted to the study of the reaction to infestation of three varieties of barley; differences in them as regards the process of tillering are discussed in detail.

[Meĭer (N. F.).] **Мейер (Н. Ф.). Schlupfwespen, die in USSR im Jahre 1929 aus** *Loxostege sticticalis*, **L. gezogen sind.** [Parasitic Hymenoptera reared from the Meadow Moth (*L. sticticalis*) in the U.S.S.R. in the Summer of 1929. (*In Russian.*)]—*Rep. Appl. Ent.*, iv, no. 2, pp. 499–501. Leningrad, 1930.

A list is given of 35 species of parasites reared in 1929 from *Loxostege sticticalis*, L., in various parts of the Russian Union, with indications of their distribution, the species concerned being :—The Chalcidoids,

Habrocytus crassinervis, Thoms., and *Trichogramma evanescens*, Westw.; the Braconids, *Apanteles affinis*, Nees, *A. ruficrus*, Hal., *A. octonarius*, Ratz., *A. sericeus*, Nees, *Cardiochiles katkowi*, Kok., *C. saltator*, F., *Chelonus annulipes*, Wesm., *Microgaster subcompletus*, Nees, *Microplitis variipes*, Ruthe, *Microtypus sacharovi*, Kok., *Orgilus obscurator*, Nees, and *Zele testaceator*, Curt.; and the Ichneumonids, *Cryptus viduatorius*, F., *C. disjunctus*, Tosq., *Phytodietus segmentator*, Grav., *Labrorychus debilis*, Wesm., *L. tenuicornis*, Grav., *Eulimneria crassifemur*, Thoms., *E. geniculata*, Grav., *E. nigritella*, Thoms., *E. rufifemur*, Thoms., *E. xanthostoma*, Grav., *Omorgus exoletus*, Thoms., *Cremastus ornatus*, Szepl., *C. decoratus*, Grav., *Angitia fenestralis*, Holmgr., *A. chrysosticta*, Gmel., *Mesochorus pallidus*, Brischke, *M. tuberculiger*, Thoms., *Anilastus notatus*, Grav., *Pimpla roborator*, F., *Phygadeuon grandiceps*, Thoms., and *P. sacharovi*, sp. n., which is described in Russian and German from the Saratov Government. *Habrocytus crassinervis* and the two species of *Mesochorus* are hyperparasites.

[Shchelkanovtzev (Ya. P.).] **Щелкановцев (Я. П.). Are Thysanoptera injurious Insects?** [*In Russian.*]—*Plant Protection*, vi, no. 1–2, pp. 39–43, 1 fig., 2 refs. Leningrad, 1929. [Recd. 1931.]

On the basis of personal observations in Russia, which are briefly described, and data from the literature, the author dissents from the view that injury to the stalks and ears of wheat attributed to thrips is due to wind [*R.A.E.*, A, xv, 52]. In the second half of May 1928, considerable injury to the leaves of rye was caused in one locality by the larvae of *Limothrips denticornis*, Hal., and in June about 25 per cent. of the ears were damaged by the adults, while as a result of the infestation by *Haplothrips tritici*, Kurdj., there was a loss of about 8 per cent. of the crop of wheat. The author believes thrips to be important pests of cereals and to be responsible for the peculiar curling of the ear-heads, leaves and stalks.

[Lebedev (A. G.).] **Лебедев (А. Г.). On the Question of the geographical Origin of the Flour Moth,** *Ephestia kühniella* **Zell.** [*In Russian.*]—*Plant Protection*, vi, no. 1–2, pp. 45–51, 16 refs. Leningrad, 1929. [Recd. 1931.]

The history of the occurrence of *Ephestia kühniella*, Zell., in Europe and America since 1877 and its distribution in different parts of the world are briefly reviewed from the literature, on the basis of which the author is inclined to believe that it originated in Mesopotamia or south-eastern Armenia.

[Puzuirnuiĭ (R. G.).] **Пузырный (Р. Г.). Observations on the Nutrition of** *Euxoa segetum* **Schiff. in the Charkov and Poltava Districts.** [*In Russian.*]—*Plant Protection*, vi, no. 1–2, pp. 53–62, 3 figs., 12 refs. Lenigrad, 1929. [Recd. 1931.]

Details are given of laboratory observations on the behaviour of the larvae of *Euxoa segetum*, Schiff., carried out in July-September 1926 in the Ukraine. In the insectary, the total number of eggs deposited by a female averaged 512, and the egg stage lasted 6–8 days. In the field, the eggs usually occurred on lumps of soil in fallow land and very seldom on weeds. The larvae feed at night, but not to so great an extent as by day. The character of the injury they cause to the

leaves of plants and the sown grain of winter rye and wheat is described, and a list is given of the various wild and cultivated plants on which they have been recorded in the Russian Union and elsewhere. When in their second instar, the larvae begin to injure germinating wheat and rye in the upper layers of the soil. Estimates of the amount of food eaten in 24 hours by the different instars are given in a table. The feeding period of the second generation lasts 44–60 days, during which time a larva under laboratory conditions at a temperature of 13–17° C. [55·4–62·6° F.] damaged 136 shoots of winter crops, or 142 germinating grains, and in the field at 8·2–16·7° C. [about 47–62° F.], each larva damaged on an average about 50 shoots of wheat. The importance of the larvae depends partly on meteorological factors and the condition of the plants ; if the autumn is dry and the shoots of the winter crops are weakened owing to lack of moisture, the presence of 2–3 larvae to 28 sq. ins. of the soil is a serious danger. Usually about 17–20 per cent. of the injured stems recover, but those that are damaged at the tillering node, or beneath it, are killed.

[VASINA (A. N.).] **Васина (А. Н.). On the Occurrence of** *Oscinella frit* **L. on wild Grasses.** [*In Russian.*]—*Plant Protection,* vi, no. 1–2, pp. 63–70, 4 graphs. Leningrad, 1929. [Recd. 1931.]

Field observations in the environs of Ivanovo-Voznesensk (former Vladimir Government) in 1925–28 showed that grasses are constant foci for the breeding of *Oscinella frit,* L., and are especially favoured by the autumn generation. The larvae were found on the following plants, given in the order of preference : *Agropyrum repens, Phleum pratense, Poa* spp., *Agrostis alba, Anthoxanthum odoratum, Agrostis vulgaris,* and *Festuca* spp. Grasses near cultivated fields were particularly heavily infested. Other Dipterous pests of cereals found on some of the same grasses included *Meromyza saltatrix,* L., *Elachyptera cornuta,* Fall., *Opomyza florum,* F., *Chlorops taeniopus,* Mg., *Hylemyia* (*Leptohylemyia*) *coarctata,* Fall., and *Amaurosoma flavipes,* Fall., as well as the flea-beetles, *Chaetocnema hortensis,* Geoff., and *C. aridula,* Gyll.

[SAKHAROV (N. L.).] **Сахаров (Н. Л.). On the Parasitism of** *Gonia* **and** *Cnephalia* **in the Larvae of** *Euxoa segetum* **Schiff.** [*In Russian.*]—*Plant Protection,* vi, no. 1–2, pp. 71–74, 1 fig., 3 refs. Leningrad, 1929. [Recd. 1931.]

In the summer of 1928, adults of the Tachinid, *Gonia ornata,* Mg., taken in the field on 12th May, were placed in an insectary containing various weeds, on which the females oviposited, laying their eggs singly, chiefly on the upper surface of the leaves. The eggs are described. It was found that the larva may remain alive in the hard shell of the egg for as long as 2½ months, and probably survives until September when the larvae of the second generation of *Euxoa segetum,* Schiff., are mature. In July fourth and fifth instar larvae of *E. segetum* were fed on leaves harbouring eggs of the Tachinid. Subsequent dissection of the larvae and pupae of the moth showed that all of them contained larvae of the parasite, their number corresponding in each case to that of the eggs swallowed by the host, though only one survives eventually. The Tachinid larva hatches within 5 hours after the egg has been swallowed and completes development in 20 days. *G. ornata* has one generation a year and hibernates in a cocoon in the pupa of the host.

In another insectary, where numerous larvae of *E. segetum* and *Feltia exclamationis*, L., were reared on weeds, cocoons of *Cnephalia bucephala*, Mg., were found, from which the adult flies emerged on 23rd August. This Tachinid has two generations a year, which parasitise the two generations of these Noctuids.

[ENGEL'HARDT (V. M.).] **Энгельгардт (В. М.). The Army Worm,** *Cirphis unipuncta* **Haw. in the Russian Far East.** [*In Russian.*]—*Plant Protection,* vi, no. 1–2, pp. 75–78, 3 refs. Leningrad, 1929. [Recd. 1931.]

Some of the information contained in this paper has already been noticed from a previous report [*R.A.E.*, A, xvi, 41]. The distribution of *Cirphis unipuncta*, Haw., in the Amur and Vladivostok regions is briefly discussed, and the habitats preferred by it, which are always damp and swampy areas, are described. In the Vladivostok region there are two generations a year and probably a partial third. Oviposition occurs about 10th June [*cf. loc. cit.*], and the egg, larval and pupal stages of the first generation last 5–8, 30–32 and 10–12 days respectively. The behaviour of the larvae, which chiefly attack grasses and cereals, is described. The adults of this generation lay eggs between 10th and 15th August, chiefly on the grass growing on the banks of rivers and along the irrigation ditches of rice-fields, as the meadows are usually mown by this time. The larvae hatch in 6–8 days and are considerably less injurious than those of the first generation, as most of the crops are too advanced, though serious injury may be caused to rice. Owing to the heat in August, the larvae mature more rapidly than those of the first generation, and many pupate at the beginning of September ; hibernation takes place in the larval or pupal stage. In the insectary adults of the second generation emerged in September and oviposited at the end of the month or early October. It is probable, therefore, that third generation larvae may occur in the field near Vladivostok, where the autumn is very warm, and may enter hibernation.

In 1926, about 42 per cent. of the larvae and pupae were parasitised by various Hymenoptera and Diptera, and adults and larvae of the Carabid, *Calosoma chinense,* Kby., destroyed numbers of the larvae of the first generation.

[PYATNITZKIĬ (G. K.).] **Пятницкий (Г. К.). A few Lines concerning ecological Lists of the injurious Forest Insects.** [*In Russian.*]—*Plant Protection,* vi, no. 1–2, pp. 153–159. Leningrad, 1929. [Recd. 1931.]

The desirability of making ecological lists of forest pests from various parts of the Russian Union and publishing them in a special periodical is discussed. They should include such details as notes on the date and time when the pest was observed, the type of forest, the condition, age and position of the infested tree, the characters of the part attacked and the injury caused, the degree of infestation, the stage in which the pest was found, the dimension and position of the mother and feeding galleries (of bark-beetles), the behaviour of the adults, and associated insects. An example is given of a report on a species of bark-beetle made on these lines.

[Ruzaev (K. S.).] **Рузаев (К. С.). Notes on the Biology of** ***Hyponomeuta malinellus*** **Zell.** [*In Russian.*]—*Plant Protection*, vi, no. 1–2, pp. 213–219. Leningrad, 1929. [Recd. 1931.]

A detailed account is given of the biology of *Hyponomeuta malinellus*, Zell., on apple, as observed in orchards and in the laboratory in the town of Ural'sk in 1928. The examination in the spring of the protective coverings of the eggs, under which the larvae hibernate, showed that about 69 per cent. of the latter had been killed by the preceding severe winter; this, together with the fact that about 80 per cent. of the larvae and pupae were destroyed by parasites in 1927, greatly reduced the infestation in 1928. Owing to the cold and rainy weather in the spring, the emergence of the larvae from the protective shields was retarded until the 13th–20th May. The larvae of all instars and their behaviour are described. They mine in the leaves for 8 or 9 days and then emerge on the upper surface and construct silken nests, in which they live in groups and skeletonise the leaves. During an outbreak, such as that of 1927, those of the fourth and fifth instars migrate to adjoining trees, descending on silken threads from the one they have defoliated. The larval stage lasts 34–39 days. Pupation occurs in the nests, on the lower surface of the leaves or in the forks of young branches, in dense white cocoons, which are attached in the web in close regular rows. In 1928 each nest contained 20–30 cocoons as compared with 200–300 in 1927. The adults emerge in 11–13 days. In the insectary they appeared between 28th June and 4th July, while in the field emergence continued till 22nd July. Pairing takes place 6–7 days after emergence, and oviposition begins 7–10 days later. The eggs are laid in patches of about 50 on the bark of young branches, usually near the leaf buds, and are covered with a glutinous secretion from the female, which hardens and forms a protective shield. The oviposition period varies from 1 to 18 days. In the insectary the adults lived 34 days on an average, with a maximum of 57. The average number of eggs deposited by a female was 117, with a maximum of 154; in the field a female may lay 150 eggs on an average, with a maximum of 190. The larvae hatch in 19–22 days, but remain under the protective cover until the following spring.

In 1928, *H. malinellus* was parasitised by Tachinids and by the Ichneumonids, *Pimpla alternans*, Grav., and *Angitia chrysosticta*, Gmel., and the Encyrtid, *Ageniaspis fuscicollis*, Dalm.

[Popov (P. V.).] **Попов (П. В.). Notes on** *Euxoa tritici* **L.** [*In Russian.*]—*Plant Protection*, vi, no. 1–2, pp. 221–223, 1 ref. Leningrad, 1929. [Recd. 1931.]

Euxoa tritici, L., causes considerable damage in the Saratov Government to young melons, watermelons and pumpkins. Observations in 1926 showed that it has one generation a year. The adults were on the wing from mid-June to late September. In the insectary the number of eggs deposited by a female averaged 788, with a maximum of 1,163. The eggs, which are briefly described, are laid singly or in groups of 5–10 in the soil and are covered with a sticky secretion to which small particles of earth adhere. Those deposited in the second half of August did not hatch, although completely formed larvae were observed in them 15–20 days after they had been laid, and remained alive at room temperature until winter. The eggs deposited in June

probably produce larvae that hibernate, as individuals of the fourth instar occurred among the larvae present in the field in the following May. The young larvae live on the leaves of various weeds ; those of the third instar attack various cultivated plants, particularly those grown in sandy soil. They shelter during the day in the upper layer of the soil, and appear on the surface only at night. Poisoned baits and weed destruction would probably be the best methods for control.

[Telenga (N. A.).] **Теленга (Н. А.). Hymenopterous Parasites of the Family Ichneumonidae, reared at the Kuban Plant Protection Station in 1927.** [*In Russian.*]—*Plant Protection*, vi, no. 1–2, pp. 225–226. Leningrad, 1929. [Recd. 1931.]

Ichneumonids reared from Lepidopterous pests in the town of Krasnodar in 1927 included : *Pimpla instigator*, F., from pupae of *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, L.), *Porthetria* (*Lymantria*) *dispar*, L., *Malacosoma neustria*, L., and *Pieris brassicae*, L. ; *P. maculator*, F., *P. examinator*, F., *Agrypon stenostigma*, Thoms., and *Chorinaeus tricarinatus*, Holmgr. var. *nigrofemur*, n., from pupae of *Hyponomeuta malinellus*, Zell. ; *Theronia atalantae*, Poda, from pupae of *P. dispar* ; *Anilastus ebeninus*, Grav., and *Angitia rapae*, Meyer, from larvae of *P. brassicae* ; *A. fenestralis*, Holmgr., from larvae and *Diadromus subtilicornis*, Grav., from pupae of *Plutella maculipennis*, Curt. ; and *A. chrysosticta*, Gmel., and *A. armillata*, Grav., from larvae of *H. malinellus*. *Agrypon stenostigma*, *D. subtilicornis* and *C. tricarinatus* var. *nigrofemur* are described.

[Makaryan (M. I.).] **Макарян (М. И.). On the Occurrence of** *Schistocerca gregaria* **Forsk. in the Armenian Republic.** [*In Russian.*]—*Plant Protection*, vi, no. 1–2, pp. 227–228, 4 refs. Leningrad, 1929. [Recd. 1931.]

A male and female of *Schistocerca gregaria*, Forsk., ph. *solitaria* (*flaviventris*, Burm.), which are briefly described, were found on 7th August 1928 in the south of the Armenian Republic at an altitude of 1,476 ft.

[Kuznetzova (E. A.).] **Кузнецова (Е. А.).** *Epicauta suavis* **Haag, new to USSR.** [*In Russian.*]—*Plant Protection*, vi, no. 1–2, pp. 229–230. Leningrad, 1929. [Recd. 1931.]

A description is given of the adults of *Epicauta suavis*, Haag, which were present in numbers, together with *E. erythrocephala*, Pall., in June 1928 on a steppe in the Ferghana Region (Eastern Uzbekistan) heavily infested with *Calliptamus italicus*, L. Numerous adults were also found in Bokhara and east of the Aral Sea (Perovsk), and as they invariably occurred in places infested with *C. italicus*, this Meloid is probably a natural enemy of the locust. It has not been previously recorded from the Russian Union.

Borg (P.). **[Report of the] Plant Pathologist.**—*Rep. Supdt. Agric. Malta 1929–30*, pp. xiv-xvii. Malta, 1930.

Notes are given on the injurious insects occurring in Malta during 1929–30. Contrary to expectation, the moist southern winds during the winter had no adverse effect on *Novius cardinalis*, Muls., which

effectively controlled *Icerya purchasi*, Mask. It also attacks *I. aegyptiaca*, Doug., on *Carthamus lanatus*, *Carlina* and *Carduus*, and is abundant during the winter on infested plants in sheltered situations. A spray of 2–3 per mille potassium permanganate [given, apparently erroneously, as 2–3 per cent. in another report (*R.A.E.*, A, xviii, 262)] was used with good results against armoured scales. It should not be applied to unhealthy trees or during the hot hours of the day, as scorching may result. Stone-fruit trees are also adversely affected when in leaf. In orange groves that have been treated during the past years, *Chrysomphalus dictyospermi*, Morg., is negligible, and *Aulacaspis pentagona*, Targ., is only observed on ornamental trees and shrubs in some gardens and sometimes on stone-fruit trees growing in fields.

Results as satisfactory as those of the previous year [xviii, 260] were obtained in orange groves with 3 soil injections in the summer and autumn of carbon bisulphide against the pupae of *Ceratitis capitata*, Wied. (European fruit-fly), but this treatment can only give temporary relief as reinfestation from other sources constantly occurs. In general, Aphids were not so prevalent as in the previous year [xviii, 261], but damage to *Citrus* by *Toxoptera aurantii*, Boy., was very marked in some cases. The predacious Coccinellids, *Chilocorus bipustulatus*, L., and *Coccinella septempunctata*, L., were numerous, but in many cases spraying was necessary. *Cerambyx miles*, Bon., caused damage to pears and apples; the larval tunnels were plugged with cotton wool soaked in carbon bisulphide.

A serious outbreak of *Phylloxera* was recorded during the summer on European vines and on the foliage of American vines used for stocks. The latter were sprayed with 1 per cent. nicotine sulphate, and the usual winter soil treatment with carbon bisulphide was applied in a number of vineyards.

American vines were attacked in the nurseries by *Pentodon punctatus*, Vill., the larvae of which destroyed the young roots about an inch below the surface of the soil. They take 4 years to mature, and strong doses of carbon bisulphide were injected at a depth of 1½ ft. and about a yard apart before planting new cuttings.

Bodenheimer (F. S.). **Theoretical Considerations on the Evaluation of Control Measures.**—*Hadar*, iii, no. 12, reprint 14 pp., 1 fig., 4 refs. Tel-Aviv, December 1930.

A table is given showing the theoretical influence of mortality of 98, 90, 80 and 60 per cent. following control measures on insects producing different numbers of eggs and with varying numbers of annual generations, firstly under the supposition that every egg laid developed to sexual maturity and secondly under approximately natural conditions. Where there is only one annual generation, it will rarely be necessary to spray more than once a year, and the time of application is of less importance. In such cases, assuming that each female lays 100 eggs, after 90 per cent. mortality has been secured, control measures need only be repeated in the third year. As, however, most major pests in Palestine have 3–5 generations or even more, it is obvious that a greater mortality than 90 per cent. must be obtained if control measures are not to be repeated.

Chrysomphalus aurantii, Mask. (red scale) has 3–4 generations in orange groves in Palestine, and each female produces about 100 young larvae. As the infestation of 100 leaves varies during the year between

10 and 250 scales, it would appear that natural mortality is much less than 95 per cent. of the larvae born. Control work in orange groves is started at the beginning of August, coinciding with the start of an increase in the number of scales present from 10 in the middle of July to 248 in the beginning of September. The varying degrees of mortality secured with different spraying materials is shown, the best results being obtained with a 2½ per cent. volck oil which gives 90–98 per cent. mortality. Estimates of the increase of the scales following different percentages of mortality show that any mortality below 90 per cent. must be regarded as unsuccessful. One spraying with volck oil should be sufficient for a whole year provided that the starting pressure of the pump is not less than 5 atmospheres, the nozzle gives a fine spray, and the treated grove is not reinfested from adjacent untreated ones. It is, however, not necessary to spray a whole grove, but only those parts of it that show heavy infestation. If, owing to exceptional climatic conditions, natural mortality is less than usual, a second application is advisable. As infestations on grapefruit start in April, it should be sprayed twice a year, in April and August. These results are based on the supposition that spraying is started when the population of *C. aurantii* is at its minimum.

The growth of the population follows an S-shaped curve which can be divided into three parts. In the first, where the infestation is below 25 per cent., the density is too small to promise any recognisable effect ; in the second, where the infestation increases sharply from 25 to 75 per cent., control work followed by even moderate mortality will be quite effective ; whereas in the third, where the infestation rises from 75 to 100 per cent., the density is so high that even effective measures give very poor results, and only abnormally high natural mortality will terminate the attack. The same effort that gives unsatisfactory results in the first and third stages may therefore be satisfactory in the second, the best results being obtained when the control measures are applied at the central point of the S-shaped curve, where the infestation is at 50 per cent. These conclusions are confirmed by Zwölfer, who found the infestation of *Pyrausta nubilalis*, Hb., at Rastatt in 1926 to be 353 larvae to 100 maize plants, whereas by the autumn of 1927 it was only 51. As females of *P. nubilalis* lay 250 eggs each, the difference in the density of population can be ascribed almost entirely to efficient control work, as no other factors showed any remarkable difference in comparison with 1926. The mortality thus secured by artificial means may be estimated at 97·78 per cent., and without it the population would have increased to 2,295 larvae to 100 maize plants, an increase of 5–6 times the density of 1926, an increase actually observed at Rastatt where no control measures had been applied. These measures had been applied when the population was at its minimum.

Paoli (G.). **Caratteri diagnostici delle** *Empoasca* **e descrizione di nuove specie.** [Diagnostic Characters of *Empoasca* and Description of new Species.]—*Atti Soc. toscana Sci. nat.*, Proc. verb., xxxix, no. 5, reprint 14 pp., 7 figs., 12 refs. Pisa, 1930.

The new species described are *Empoasca dolichi* on *Dolichos lablab* in Italian Somaliland [*cf. R.A.E.*, A, xviii, 659], *E. vitium* on vines in Italy and France ; and *E. decipiens* on egg-plant (*Solanum melongena*), potato, tomato, and beet in Italy.

Cotterell (G. S.). **Report on the Occurrence of *Sahlbergella* spp. and other Insect Pests of Cacao in Fernando Póo, San Thomé and the Belgian Congo.**—*Bull. Dept. Agric. Gold Coast*, no. 22 (*Yearb. 1929*), pp. 112–145, 4 pls., 16 refs. Accra, 1930.

Much of this information has already been noticed from another report [*R.A.E.*, A, xix, 189]. In addition to the pests there recorded on cacao, minor damage was done by the larvae of Limacodids, *Parasa* spp., in the Belgian Congo, where they are commonly reported as defoliating cacao grown without overhead shade. In the Gold Coast the caterpillars of *Diacrisia* spp. attack dying cacao grown without shade, and have been reported as attacking the foliage in the Belgian Congo. An Aphid, *Toxoptera* sp., is frequently present in San Thomé and parts of the Congo, but does little damage. The Psyllid, *Mesohomotoma tessmanni*, Aulm., is abundant in parts of the Congo, but was very rare in San Thomé and Fernando Po at the time of the author's visit.

Reports received from Experiment Stations, 1929–30.—Med. 8vo, xi+342 pp., ill. London, Empire Cotton Growing Corp., 1931. Price 2*s*. 6*d*.

These reports on cotton pests follow similar lines to those of the previous year [*R.A.E.*, A, xviii, 296] and many of the pests recorded are the same. W. G. Wells (pp. 26–30) states that *Dasus* (*Gonocephalum*) sp. (false wireworm) was particularly prevalent at the Biloela Station, Queensland, and on adjacent farms, stands of young cotton seedlings in most experimental plots being seriously injured and a commercial crop of 100 acres almost completely destroyed. Injury was far more severe in plots where one crop of cotton followed another than in those where it followed green manure treatment. A bait of 25 lb. bran, 1 lb. Paris green and 1 quart molasses, with a little water added to moisten it, scattered among the rows of cotton seedlings, gives good control within a short period of time, mortalities of 79 per cent. after 33 hours and 90 per cent. after 5 days being obtained. Cotton was not attacked by *Euxoa radians*, Guen., but at the end of November, maize was severely infested by the nearly full-grown larvae, which were, however, controlled by Paris green baits. *Heliothis obsoleta*, F., was the chief factor responsible for the failure of the cotton crop during the season. For three years in succession infestation occurred on a lucerne plot adjacent to a plot of early planted cotton, and the larvae migrated to the latter as the lucerne apparently became less attractive. The migration was effectively checked by scattering a poison bran bait along the furrow separating the two plots. If the lucerne could be cut at the proper time to destroy the young larvae and eggs, it is probable that it might be useful in aiding in the control of the December brood. During the three years there was a variation of 10 days in the dates on which the migration began.

Pests of cotton occurring in South Africa (Barberton) are dealt with by F. S. Parsons (pp. 83–84) [*cf.* xvii, 293; xviii, 296]. Reference is made to experiments in the mass-breeding of parasites of the red and American bollworms [*Diparopsis castanea*, Hmps., and *Heliothis obsoleta*], particularly *Trichogramma lutea*, Gir., the adults of which were reared from eggs of the bollworms collected in the field. The parasites were reared on eggs of *Sitotroga cerealella*, Ol., and multiplied rapidly.

In Natal, P. A. Bowmaker (pp. 96–98) reports that a definite method of controlling *Syagrus rugifrons*, Baly, is to adopt some form of crop rotation. A strip of about 5 yards in width of ratoon cotton should be left round the infested lands to prevent the beetles from migrating to the land where cotton is to be planted the following season. When they appear, the trap rows should be heavily dusted with calcium arsenate, and hoed out when the plants have reached a stage when they can no longer be killed by the beetles.

From Southern Rhodesia (Gatooma), J. E. Peat records (pp. 121–138) an attack by *H. obsoleta*, which started early in March, rose to peaks in mid-March and again in mid-April, and continued throughout May. The relative injury caused by *H. obsoleta*, *Diparopsis castanea* and *Earias* is discussed. Although a considerable number of larvae and pupae of the first two were found to be parasitised by Tachinids and Sarcophagids, parasites do not aid to any extent in controlling an infestation. The larvae appear to be mainly of a fair size before being parasitised, the majority being able to pupate. Dusting with calcium arsenate on 11th April, at the peak of the second attack, killed about 60 per cent. of *H. obsoleta*, but had no effect on *D. castanea*, and little on *Earias*. Experiments in the use of cotton-seed traps against *Dysdercus* are discussed. Twelve were used to the acre, and heaps of 2 oz., 8 oz., and 3 lb. gave catches of 570, 800 and 1,200 adults, respectively. When additional shade was provided the catches were increased on an average by 25 per cent. Termites and Tenebrionid larvae also caused some injury to cotton during the season.

In the course of investigations, described by A. G. Bebbington and W. Allan, in Northern Rhodesia (Mazabuka) (pp. 180–198), the examination of over 30,000 bolls of cotton revealed that in practically every case of infection with internal boll-rot the disease was associated with sucking insects. It was found experimentally that the Pentatomid, *Callidea dregei*, Germ., is capable of transmitting it. The seasonal distribution of *Dysdercus* spp. in the field, the distribution of staining caused by them and the value of traps for their control are discussed. Other pests of cotton included *Liogryllus bimaculatus*, DeG., which destroyed the seeds in the ground; the Galerucid, *Exora apicipennis*, Jac., which appeared in large numbers and caused injury to the foliage; and *Zonocerus elegans*, Thnb., and *Cyrtacanthacris aeruginosa*, Stoll, which damaged the leaves and growing tips.

Extract from a Report on Forests and Forestry in Korea. (Communicated by His Britannic Majesty's Consul-General, Seoul.) Paras. 166–171, 2 pp. typescript. [1931.]

Dendrolimus spectabilis, Butl. (pine lappet caterpillar) is the most serious forest pest in Korea, where it has been spreading at an alarming rate since 1925 and now causes annual losses estimated at about £200,000. The spread of this pest has been facilitated by the fact that most of the existing private forests consist of red pine. Two species of Hymenopterous parasites attack the larvae. Direct attempts to exterminate the moth appear hopeless, as they simultaneously reduce the numbers of its natural enemies, and attention is now rather being directed to increasing the numbers of the latter. In view of the danger of over-extensive cultivation of red pine, local governors have been empowered to limit the felling of broad-leaved trees and to order, where necessary, the plantation of mixed forests. Pine forests in

the Yalu are being ravaged by the San José scale [*Aspidiotus perniciosus*, Comst.], which attacks the over-mature trees in the virgin forest. The only method of checking its activities is to fell such trees before they are attacked.

KUWAYAMA (S.). *Lema oryzae* **sp. nov.**—*Insecta matsum.*, v, no. 3, p. 155. Sapporo, March 1931.

The Criocerid previously recorded as *Lema melanopa*, L., on rice in Japan [*R.A.E.*, A, xiv, 201 ; xviii, 8] is now described as *L. oryzae*, sp. n.

SILVESTRI (F.). **Contributo alla conoscenza delle specie orientali del genere** *Prospaltella* (**Hym. Chalcididae**). [A Contribution to the Knowledge of the Oriental Species of the Genus *Prospaltella*.]—*Boll. Lab. Zool. Portici*, xxv, pp. 49–68, 11 figs. Portici, 27th December 1930.

New species described from Coccids on *Citrus* are : *Prospaltella nupta* from *Chrysomphalus* (*Aonidiella*) *aurantii*, Mask., in the Philippines ; *P. inquirenda* from *C. aurantii*, *Lepidosaphes gloveri*, Pack., or *Parlatoria oleae*, Colv. (as all three occurred together) in China ; *P. singularis* from *Lepidosaphes beckii*, Newm., in Formosa ; and *P. inserens* from *L. gloveri* in Japan. *P. explorata*, sp. n., and *P. affectata*, sp. n., were bred from *Lepidosaphes* spp. on other plants in Japan, and in China and Tonkin, respectively.

MILLER (N. C. E.). **Two important Pests of the Clove Tree.**—*Malayan Agric. J.*, xix, no. 1, pp. 9–13, 2 pls. Kuala Lumpur, January 1931.

The Cerambycid, *Chelidonium brevicorne*, Schwarzer, and the Tineid, *Paralecta antistola*, Meyr., are thought considerably to have reduced the clove crop in parts of Malaya. The larva of *P. antistola* feeds at night, mainly on the bark of the clove tree [*Eugenia caryophyllata*], under a mass of silken webbing and frass that conceals the burrow. The latter is usually situated between the forks of branches measuring ½–1 in. in diameter and is apparently only used as a retreat during the day. These boring habits result in " die-back " and decay. The pupal period lasts 21 days. The larva, pupa and adult are described. The life-cycle of *C. brevicorne* requires about a year, the egg probably being laid in May, on or under the bark, and pupation probably taking place about February. Control measures have hitherto consisted of cutting away a portion of the bark round the edge of the hole and spearing the grub with a wire, but this practice may result in irreparable damage to the tree. Until further information is obtained as to the ecology of these two pests and the extent to which the trees will react to the injection of chemicals, the following preventive measures should be carried out : careful pruning of smaller infested boughs ; treating the cut surfaces with tar or some similar substance ; and prevention of infestation by the application of washes, of which one consisting of fish-oil and crude carbolic acid would probably prevent oviposition by the Cerambycid if applied to the trunks and lower branches.

C[ORBETT] (G. H.). **Entomological Notes. Fourth Quarter, 1930.**—*Malayan Agric. J.*, xix, no. 1, pp. 36–40, 1 pl. Kuala Lumpur, January 1931.

Experiments were carried out in Malaya to estimate the difference in the numbers of female coconut flowers falling owing to the boring of *Tirathaba rufivena*, Wlk., from inflorescences in which the spikes burst naturally and from those in which the sheath was artificially removed when the spikes were on the point of bursting. The results showed that the number of nuts bored by *T. rufivena* is considerably reduced by the removal of the sheath, but indicate that this reduction increases the fall from other causes. The figures undoubtedly suggest that this moth is of no importance in reducing the yield of coconuts in the two experimental areas. An Anthomyiid [*Phaonia corbetti*, Malloch] has been recorded for the first time arresting the development of the female inflorescence of the nipa palm [*Nipa fruticans*] and inhibiting the production of juice. The eggs are laid in groups, sometimes on the sheathing leaves as soon as they appear, but generally on the male flowers, on which the maggots feed, subsequently mining the flower stalks and reaching the peduncle of the female inflorescence. Satisfactory results were obtained by covering the inflorescence with mosquito netting and by removing the male flowers before they appeared; as more juice is thought to be obtained from artificially pollinated flowers, the latter measure is undoubtedly economically justified. The caterpillar damaging the fruits of the oil-palm [*Elaeis guineënsis*] [*R.A.E.*, A, xix, 139] has been identified as a species of *Tirathaba*. No further reports of injury by it have been received.

Leptocorisa acuta, Thnb., occurred in large numbers on an area of rice as soon as the flowering stage was reached. Catching with sticks, one end of which is dipped in a sticky solution of castor oil and resin, was recommended. Hill rice has been damaged by *Patanga succincta*, L., and budded rubber [*Hevea*] by *Catantops humilis*, Serv., and *C. splendens*, Thnb.

The larvae of *Phthorimaea* (*Gelechia*) *heliopa*, Lw., mine the leaves and mid-ribs of tobacco and on reaching the stem cause swellings in which pupation usually takes place, though it sometimes occurs in the mid-rib. Seedling tobacco may be seriously damaged by this pest, and in the Netherlands Indies nurseries are covered by mosquito netting early in the evening. Tobacco plants may be protected from *Psara submarginalis*, Swinh., by a spray of 1 per cent. lead arsenate. Young shoots of tea were damaged by *Toxoptera aurantii*, Boy., and seedlings by *Brachytrypes portentosus*, Licht. (*achatinus*, Stoll). *Stephanoderes* (*Cryphalus*) *hampei*, Ferr., has been found in coffee areas in which it had not been previously recorded.

Termites caused unhealthy looking patches on golf greens by covering the grass with a thin compact layer of earth. Spraying with good quality lead arsenate was recommended. The timber of *Balanocarpus hemeii*, even though buried in a termite nest, appears to be immune from attack by termites. "Cellactite," a roofing material, has also withstood termite attack since December 1924. A syrup, which is widely used in America and which is almost identical with one already noticed [*R.A.E.*, A, viii, 285], has given most satisfactory results in the control of ants in bungalows and houses in Malaya. The mixture should be placed in shallow vessels about the house, or saturated sponges should be placed in tins with punctured lids.

Corbett (G. H.). **The Bionomics and Control of** *Leptocorisa acuta* **Thunb. with Notes on other** *Leptocorisa* **spp. in Malaya.**—[*Bull.*] *Dept. Agric. S.S. & F.M.S.*, Sci. Ser., no. 4, 40 pp., 7 pls., 18 refs. Kuala Lumpur, 1930. Price $1.00.

The history of the species of *Leptocorisa* known to attack rice is discussed from the literature. Five occur in Malaya, but practically all the damage is caused by *L. acuta*, Thnb., as *L. costalis*, H.-S., *L. lepida*, Bredd., *L. corbetti*, China, and *L. varicornis*, F., appear to prefer grasses. It is therefore important to be able to distinguish *L. acuta* from the other species, so that useless expenditure may not be incurred in clearing areas of grasses supporting only species that cause little injury to rice. Keys are given to the five species under discussion and to the eggs of all except *L. costalis*, and the various nymphal instars of *L. acuta* and *L. lepida* are described. No constant character was found for distinguishing the nymphs of *L. varicornis* and *L. corbetti* from those of *L. acuta*.

A list of the food-plants of *L. acuta* is given. The nymphs and adults probably feed throughout the day, but prefer the early morning and late evening and seek the shelter of the leaves during the mid-day heat. Although the adults fly from plant to plant when disturbed, they appear incapable of sustained flight. Newly emerged nymphs can live on the sap of the leaves of rice and grasses for at least 48 hours and survive without food for 24, but those of the later instars can apparently only mature on the developing grain. Although only one crop of rice is raised annually in Malaya, there is considerable variation in the date of transplanting seedlings ; this involves continuous flowering from mid-November till mid-February, which permits of the development of as many as three generations of *L. acuta* and increased loss. Observations indicate that the bug has a period of inactivity during the drier months and migrates to more shady places at the close of and even before the rice harvest, leaving its aestivating quarters the following season in large numbers just before the rice comes into flower. If wet weather prevails, migration before harvest does not take place to so great an extent. The instinct to migrate is less developed in the other species.

Oviposition occurs mainly at dusk, the eggs being deposited in two regular rows fastened to the leaf by means of a gummy substance. The average number laid by a female is about 100. They are usually laid on the upper surface of the leaf, but in some cases on the lower, towards the apex, which frequently becomes rolled. Under laboratory conditions, eggs were first laid 9–41 days after the female had attained the adult stage, and the total egg-laying period ranged from 11 to 60 days. The eggs of all species of *Leptocorisa* hatch in about 7 days, and the nymphs begin to feed 3–4 hours after hatching. The nymphal periods of *L. acuta*, *L. corbetti*, *L. varicornis* and *L. lepida* are recorded in tables, the duration of the nymphal instars being remarkably similar, with an average total of about three weeks. Although no parasite was obtained from the nymphs or adults, the eggs of *L. acuta* were often attacked by an unidentified Chalcidoid, the life-cycle of which required 10–15 days, only one parasite emerging from each host egg. The longevity of the adult varied from 3 to 16 days. The method of oviposition is described. Parasitism in no case exceeded 26 per cent., and was heaviest immediately after the rice had burst into flower. Observations are recorded on the Reduviids, *Euagoras plagiatus*,

Burm., and *E. sordidatus*, Stål, which readily devoured the nymphs of *Leptocorisa* spp. in the laboratory. *Cicindela aurulenta*, F., has been found in the neighbourhood of rice fields, but has not been recorded as predacious on rice-bugs.

Control measures, which are discussed at length, include the breeding and selection of strains of rice resistant to *Leptocorisa*; and the collection of nymphs in bags and hand-nets, which are described. The bugs should be collected when they swarm on flowering grasses preparatory to an attack on adjacent rice. They may also be attracted to trap areas of grasses or rice and collected before the flowering of the main crop. Every endeavour should be made to obtain uniformity in time of transplanting and variety of rice, so that flowering should be simultaneous. The insects may be temporarily cleared by burning aromatic and resinous substances to windward of them. The nymphs may be shaken off infested heads of rice into pans containing water and a small quantity of kerosene, or caught with wands dipped in a sticky mixture [see preceding paper]. Experiments to determine whether the bugs are attracted by the smell of decaying meat [*R.A.E.*, A, vii, 493] showed that it exercised some degree of attraction when in the initial stages of decomposition. Without organised campaigns against *Leptocorisa*, heavy losses are certain to be sustained, but if they are undertaken sufficient control will be secured to obviate any great reduction in yield.

MEYRICK (E.). **Exotic Microlepidoptera, iv, pts. 2 & 3.**—pp. 33–96. Marlborough, Wilts, the author, February & March 1931. Price 3*s*. per part.

New Tineids described include *Acrocercops euthycolona*, mining leaves of *Mimusops elengi* in Java; *A. siphonaula*, mining leaves of *Cola* in Sierra Leone; *Pyroderces dactyliota*, bred from decaying flowers of coconut (*Cocos nucifera*), and *P. centropecta* from fruits of *Elaeis guineënsis*, both in Malaya; *Ascalenia gastrocosma* and *Aphanostola* (gen. n.) *atripalpis* on leaves of *Acacia catechu* in Bihar, India; *Peucoteles* (gen. n.) *herpestica* on *Pinus khasia* in Assam; *Idiophantis acanthopa* on *Eugenia jambolana* in United Provinces, India; *Coconympha* (gen. n.) *iriarcha* on leaves of coconut in Malabar; *Lecithocera corythaeola* on coffee in Uganda; and *Batrachedra atriloqua* on coconut in Fiji and Java. The larvae of *B. atriloqua* bore into and usually complete development within the spathe before it opens, whereas those of *B. arenosella*, Wlk., which occur in the same countries, never bore through the spathe, but wait till it splits.

CURRIE (G. A.). **The Brown Cutworm** (*Euxoa radians* **Guen.**).—*Queensland Agric. J.*, xxxiv, pt. 1, pp. 10–16; pt. 2, pp. 138–163, 7 pls., 11 graphs; pt. 4, pp. 383–390, 1 pl.; pt. 5, pp. 488–495, 1 fig.; xxxv, pt. 1, pp. 18–33, 4 graphs, 22 refs. Brisbane, July, August, October, November 1930, & January 1931.

This is a detailed account of the bionomics, natural enemies and control of *Euxoa radians*, Guen. (brown cutworm), all stages of which are described. Much information has been collected with regard to the importance of its attacks, particularly on cotton, and in working out the general ecology, a special study has been made of the rate of development of this moth in relation to temperature. It is hoped that

the results of this study will aid in predicting outbreaks. *E. radians* is the most destructive cutworm in Queensland, occurring throughout the agricultural areas. In coastal areas damage is done throughout the year to vegetable crops on light soils, but in general the greatest injury occurs in spring and autumn. West of the coastal range, sporadic infestation occurs in the spring months, cotton, young maize and the young growth of grape vines being chiefly attacked. In localities where there is no frost, breeding is continuous, but where frosts occur only the pupal stage can survive the winter. The eggs are deposited in batches of varying sizes (from 7 to 569 have been observed in the laboratory), and one female has been found to contain 1,200 eggs. The larvae of the spring generation are most destructive to cotton, and there is sometimes a recrudescence of damage from the second generation, but the mid-summer generation is seldom a very serious menace. Pupation takes place in an earthen cell in the ground. The rate of growth of all stages of *E. radians* increases proportionately with a rise in temperature between 20 and 28° C. [68 and 82·4° F.], but outside this range the relation is not directly proportionate. The development of one generation from egg to egg requires about 106 days at an average of 20° C. and 52 days at 30° C. [86° F.]. Variable temperatures with wide fluctuations result in a more rapid rate of growth than constant ones. The larvae can tolerate low atmospheric humidity, but continuous high relative humidity or wetness of the soil produces disease and death. The natural enemies, which effect a considerable degree of control, include *Ooencyrtus* (*Schedius*) *euxoae*, Gir., parasitic on the eggs ; the Tachinid, *Ballardia pallipes*, Curran, and an unidentified Braconid, parasitic on the larvae ; and the Bombyliid, *Villa* sp., a parasite of the pupae. Many of the cutworms die from various bacterial diseases, especially during periods of high temperature and atmospheric humidity. A useful predator is the Sphegid, *Ammophila suspiciosa*, Sm., and certain birds are effective enemies. The distribution of *E. radians* is closely associated with that of the weed, *Portulaca oleracea*, its principal food-plant.

Climatic conditions likely to induce an attack of the cutworm in the spring appear to be a series of dry years ; good summer rains followed by a dry autumn, which allows a large autumn generation to develop ; a cold, dry winter, favourable for the survival of the pupae in the soil ; and moderate early spring rains with rising temperatures, followed by warm, dry weather. Clean cultivation is some help in reducing the numbers. Poison baits recommended against the larvae are 1 lb. Paris green and 28 lb. wheat bran, mixed dry and then made into a moist, crumbly mash with water and 1 quart molasses and applied in the evening ; or, 1 lb. calcium or lead arsenate, 16 lb. dry wheat bran and 1 quart of molasses.

A section of the paper includes a detailed discussion on the ecological factors influencing cutworm outbreaks, and in an appendix brief notes are given on other Noctuid larvae causing damage in Queensland.

MORGAN (W. L.). **Experiments in Cabbage Moth** (*Plutella maculipennis*) **Control, 1930.**—*Agric. Gaz. N.S.W.*, xlii, pt. 1, pp. 57–58. Sydney, 1st January 1931.

In experiments for the control of *Plutella maculipennis*, Curt., on cauliflowers, the insecticides recommended in 1929 [*R.A.E.*, A, xviii,

127] were compared with dusts of lead or calcium arsenate, applied by an intermittent blower machine, which produces a cloud of dust passed through a 200-mesh sieve. The lead arsenate dust gave much the best results. The treatment recommended is a 50 or 75 per cent. lead arsenate dust applied once a week during the season. For seed-beds, a 2½ per cent. nicotine dust, applied every day or two, according to the degree of infestation, is effective. Dusting with arsenicals should cease a month before cutting, owing to the danger of poison, but a nicotine dust may be used instead if necessary.

JARVIS (E.). **A little known Queensland Digger-wasp.**—*Queensland Agric. J.*, xxxv, pt. 1, pp. 6–9, 2 pls. Brisbane, 1st January 1931.

Further observations are recorded on the life-history of *Scolia formosa*, Guér. [*cf. R.A.E.*, A, x, 341], which has been successfully reared at Meringa from a female caught on 23rd May that lived for 60 days in confinement. Six males and three females were obtained from a total of 35 eggs laid on larvae of the greyback cockchafer [*Lepidoderma albohirtum*, Waterh.]. The egg, larval and pupal stages averaged 7, 16 and 83 days respectively, and the complete life-cycle occupied from 101 to 114 days at an average shade temperature of 68° F. When larvae of different cane beetles were confined in a cage with a female of *S. formosa*, oviposition occurred readily on *Lepidiota caudata*, Blkb., and *L. consobrina*, Gir., and reluctantly on *L. frenchi*, Blkb., and *Anomala antiqua*, Gyll. (*australasiae*, Blkb.), whereas larvae of *Dasygnathus australis dejeani*, Macl., and *Cacochroa decorticata*, Macl., were ignored. It is suggested that *S. formosa* may be encouraged by establishing near canefields plants on the flowers of which the adults feed, and a list of 5 suitable species is given.

CLARK (A. F.). **A Parasite of the Steel-blue Horntail Borer.**—*N.Z. J. Sci. Tech.*, xii, no. 3, pp. 145–146, 1 fig. Wellington, N.Z., December 1930.

The distinguishing characters of *Rhyssa persuasoria*, L., recently liberated in New Zealand for the control of the steel-blue horntail borer [*Sirex juvencus*, L.], and of *Megarhyssa* (*R.*) *fractinervis*, Voll., a native species, are tabulated.

OLDHAM (J. N.). **On the Infestation of Elm Bark-beetles (Scolytidae) by a Nematode,** *Parasitylenchus scolyti* **n. sp.**—*J. Helminthology*, viii, no. 4, pp. 239–248, 2 figs., 13 refs. London, December 1930.

The bark-beetles, *Scolytus scolytus*, F. (*destructor*, Ol.) and *S. multistriatus*, Marsh., taken on fallen elms in Hertfordshire, were found to be parasitised by a Nematode, *Parasitylenchus scolyti*, sp. n. About 60 per cent. of the beetles examined contained Nematodes within the body cavity in the abdominal region, the effect being to reduce the reproductive organs of the host, 40 per cent. of those parasitised being classified as sterile. Records are given of other Nematodes that have been found in Scolytids.

PAOLI (G.). **Relazione sull'attività del R. Osservatorio di Fitopatologia per la Liguria in Chiavari nel primo decennio della sua fondazione.** [Report on the first ten Years' Work of the Ligurian Station for Phytopathology at Chiavari.]—59 pp., Genoa, Fratelli Treves, 1931.

The pests discussed in some detail are *Dacus oleae*, Gmel. (olive fly), against which an arsenical bait-spray sweetened with beet molasses [*R.A.E.*, A, xviii, 368] proved effective; *Liothrips* (*Phloeothrips*) *oleae*, Costa, which caused severe losses to the olive crop in the province of Imperia until it was completely controlled by a Eulophid parasite, *Tetrastichus gentilei*, Del Guerc.; the Capsid, *Lygus spinolae*, Mey., on vines [xii, 451]; *Rhagoletis cerasi*, L., on cherries, against which a bait-spray of 1 lb. lead arsenate, 5 pts. molasses and 20 gals. water gave excellent results; and the Argentine ant, *Iridomyrmex humilis*, Mayr, which caused serious trouble at San Remo, but was controlled by a general campaign with a poison-bait [viii, 285].

SCHEWKET (N.). **Zur Biologie der phytophagen Wanze *Dicyphus errans* Wolff (Capsidae).** [On the Biology of the phytophagous Bug, *D. errans*.]—*Z. wiss. Insektbiol.*, xxv, no. 10, pp. 179–183, 7 figs. Berlin, 31st December 1930.

A disease of *Pelargonium zonale* occurs in greenhouses in Germany that deforms the plants, rendering them unsaleable. The leaves are covered with spots and crinkled. The causal agent is unknown. *Dicyphus errans*, Wolff, is found on the diseased plants in the greenhouses, and both the disease and the Capsid disappear in the open, though in preliminary experiments transmission by it was not obtained. The adult bugs are most common in February and March, occurring exclusively on *Pelargonium* and only occasionally on species other than *P. zonale*, though other food-plants, a list of which is given, have been recorded in the literature. The eggs are deposited singly in the stems or petioles, one female laying from 15 to 20. The first egg was found on 23rd March. At an average temperature of 20° C. [68° F.], they hatched in 10–15 days, and the adult stage was reached 25–60 days later, the duration of development depending largely on the food, as the Capsids feed on insects, chiefly Aphids, as well as on plant-juices, and take longer to mature on an exclusively vegetable diet. All stages die, however, in the absence of vegetable food.

ZWÖLFER (W.). **Beiträge zur Kenntnis der Schädlingsfauna Kleinasiens I. Untersuchungen zur Epidemiologie der Getreidewanze *Eurygaster integriceps* Put. (Hemipt. Het.).** [Contributions to a Knowledge of the Pests of Asia Minor, I. Investigations on the Epidemiology of *E. integriceps*.]—*Z. angew. Ent.*, xvii, no. 2, pp. 227–252, 3 figs., 3 maps, 5 graphs, 41 refs. Berlin, December 1930.

This is a discussion of the factors affecting *Eurygaster integriceps*, Put., with a view to determining whether it is liable to be a serious pest of wheat in all parts of Asiatic Turkey, or only in certain districts, and the conditions leading to attack.

In Cilicia the hibernated adults appear in March or April on barley and wheat. Pairing and oviposition occur until mid-May. The eggs,

laid usually in batches of 14, are found in larger numbers as the temperature rises. If food is abundant, from 150 to 180 are laid by a single female. The incubation period varies with the temperature, from 8 days to 3 weeks. The eggs appear to be comparatively resistant to external influences, but the young larvae seem very susceptible to high atmospheric humidity. At the beginning of the wheat harvest (end of May to mid-June) the majority of the larvae have transformed into adults and about mid-June these fly, aided by the sea winds, from the plains to the summer and winter quarters in the hills at distances of up to 120 miles. The lower limit of these areas is an altitude of about 1,500 ft., and the higher is at the edge of the tree zone, which in the Taurus is at 5,600–6,000 ft. Here the adults aestivate and hibernate in the scanty ground-litter of the forests and brushwood. In spring they return to the plains, probably assisted by the mountain winds.

A Scelionid egg-parasite, *Telenomus semistriatus*, Nees, is of local occurrence only, but two Tachinids, *Phasia crassipennis*, F., and *Clytiomyia helluo*, F., and an Asilid, *Heteropogon ornatipes*, Lw., are as widely distributed in Turkey as *E. integriceps*.

Average monthly temperatures of 20–22° C. [68–71·6° F.] characterise the chief development period of the bug. Its northern limit of distribution seems to be determined by this factor, which also enables its seasonal development to be predicted fairly accurately in any region with a known climate. Optimum conditions for an outbreak are provided when favourable temperatures coincide with a rainfall of 10–20 mm. [0·4–0·8 in.] during the chief development period for two consecutive years. Experiments have shown that a mortality of 95–100 per cent. occurs in normal summer conditions in the plain of Cilicia, so that the migration to the hills appears essential to escape these high temperatures. Thus another condition, in regions with a subtropical summer temperature, is the accessibility of mountain slopes covered with trees or brushwood. As these conditions do not occur where wheat is extensively grown, it is concluded that areas of permanent injurious infestation cannot occur in Asia Minor.

SCHIMITSCHEK (E.). **Der achtzähnige Lärchenborkenkäfer** *Ips cembrae* **Heer. Zur Kenntnis seiner Biologie und Oekologie sowie seines Lebensvereines.** [The Larch Bark-beetle, *I. cembrae.* A Contribution to the Knowledge of its Bionomics and Ecology and of its biological Associations.]—*Z. angew. Ent.*, xvii, no. 2, pp. 253–344, 31 figs., 56 refs. Berlin, December 1930.

This detailed study of *Ips cembrae*, Heer, is based on investigations in southern Moravia and in Lower Austria. These zones have different climates, and the European larch (*Larix europea*), its principal food-plant, is an introduced species in the former. The difficulty of differentiating *I. cembrae* from *I. amitinus*, Eichh., is discussed. Its geographical distribution agrees generally with that of the European larch, and outbreaks tend to occur, especially in dry years, in areas with a warm and dry climate where this tree has been introduced. In these areas the beetle is an important pest, but where larch occurs naturally, primary infestation only takes place when forestry conditions are very poor and the weather exceptionally favourable. The question of the number of generations a year is discussed in detail. Where two occur, there are two chief flight-periods, in April-May and

in August-September, the latter being that of young adults of the first generation. In particularly warm years with favourable autumn weather, young adults of the second generation may be noticed in October. The factors governing flight are discussed. Hibernation occurs in the larval, pupal and adult stages.

The food-plants of this beetle, in addition to the European larch, include spruce and certain pines but not *Pinus cembra*, of which *I. amitinus* is a typical pest. The methods of primary and secondary infestation and the biology and ecology of feeding are fully described. Experiments showed that there was no relation between attack and the hydrogen-ion concentration in the cambium-sap of the trees.

A section of the paper deals with the insects associated with *I. cembrae*. The most abundant natural enemies in southern Moravia were the Braconid, *Dendrosoter middendorfi*, Ratz., the Pteromalids, *Pteromalus* (*Rhopalicus*) *suspensus*, Ratz., and *Rhoptrocerus xylophagorum*, Ratz., and the predacious Clerid, *Thanasimus* (*Clerus*) *formicarius*, L. In Lower Austria, the most numerous were the Dolichopodid flies, *Medetera excellens*, Frey, and an undescribed species of the same genus, the larvae of which prey on the larvae, pupae, and adults of the Scolytid, *R. xylophagorum* and *T. formicarius* coming next.

HASE (A.). **Versuche und Untersuchungen zur Epidemiologie des Maiszünslers** (*Pyrausta nub.* **Hbn.**) **in den Jahren 1927 und 1928. II. Teil.** [Experiments and Investigations on the Epidemiology of the Maize Borer, *P. nubilalis*, in 1927 and 1928. Part II.]—*Z. angew. Ent.*, xvii, no. 2, pp. 345–385, 16 figs. Berlin, December 1930.

This second part of a paper on work in Berlin [*cf. R.A.E.*, A, xix, 180] is devoted to experiments made in connection with the question of the biological control of *Pyrausta nubilalis*, Hb. The equipment used is described, where it is new. For the first time an attempt was made to mark Hymenopterous parasites. The method employed, which enables marked individuals to be recognised after 18–21 days, consists in shaking up alcohol-soluble (not water-soluble) eosin in a bottle so as to coat the sides fairly uniformly. The parasites are then put in and the bottle is rolled a little so as to tint them with the dust.

It was found that laboratory-bred examples of *Trichogramma evanescens*, Westw., can infest the eggs of *Pyrausta* not only in the laboratory, but also in the field. In other experiments, made with eggs of *Ephestia* [*kühniella*, Zell.], as those of *Pyrausta* were not available, it was found that *Trichogramma* can find eggs at a distance of about 5½ ft. from the spot where it emerges. In tent experiments with *Microbracon hebetor*, Say, stated to be a parasite of the larvae of *P. nubilalis*, a high degree of parasitism of *Ephestia* and *Galleria* [*mellonella*, L.] was obtained. The Ichneumonid, *Pimpla examinator*, F., was also found to parasitise *Ephestia*, which appears to be a new host-record. To test the radius of action of parasites, dishes containing blowfly pupae parasitised by *Mormoniella vitripennis*, Wlk. (*Nasonia brevicornis*, Ashm.) (which also parasitises the pupae of Tachinid parasites of *Pyrausta*) were placed in a maize field at various distances from others containing unparasitised pupae. In one set of tests *M. vitripennis* had a radius of action of about 7 yards, and in another of about 80.

Jancke (O.) & Lange (L.). **Ueber den Befall von herbarisierten Pflanzen durch den Brotkäfer** (*Sitodrepa panicea*). [The Infestation of Herbarium Plants by *S. panicea*.]—*Z. angew. Ent.*, xvii, no. 2, pp. 386–403, 5 figs., 6 refs. Berlin, December 1930.

Sitodrepa panicea, L., is recorded as infesting two large herbaria in Germany in 1928, many of the plants being destroyed. The rest were fumigated with carbon bisulphide, and examination in 1930 showed no trace of further injury. The beetles appeared to be particularly attracted by the presence of resins and latex, as Euphorbiaceae suffered especially severely. A list is given of the various plant families involved, with a note as to the degree of attack.

Troitzky (N. N.). **Ueber die Verbreitung und Oekologie der Reblaus in Ost-Europa. Vorläufige Mitteilung.** [The Distribution and Ecology of *Phylloxera* in Eastern Europe. Preliminary Communication.]—*Z. angew. Ent.*, xvii, no. 2, pp. 404–430, 3 figs. Berlin, December 1930.

This is a brief account of the preliminary results of methodical investigations on *Phylloxera* in 1927 and 1928 in the Russian Union, many of which have been noticed.

Hering (M.). **Beiträge zur Kenntnis der Oekologie und Systematik blattminierender Insekten. (Minenstudien X.)** [Contributions to the Knowledge of the Ecology and Classification of Leaf-mining Insects.]—*Z. angew. Ent.*, xvii, no. 2, pp. 431–473, 4 figs., 2 pls., 17 refs. Berlin, December 1930.

In this further instalment of a paper on leaf-mining insects [*R.A.E.*, A, xvii, 60], an account is given of those bred in 1928, and several new species are described.

Zernoff (V.). **Microbes virulents pour les chenilles** (*Galleria mellonella* **et** *Pyrausta nubilalis*).—*C. R. Soc. Biol.*, cvi, no. 7, pp. 543–546, 1 ref. Paris, 27th February 1931.

In experiments with a number of bacteria, it was found that the majority of them killed the larvae of *Galleria mellonella*, L., at a dose of $\frac{1}{80}$ cc. of a culture on gelose emulsified in 1–5 cc. normal salt solution. A highly virulent strain isolated from larvae of *Porthetria dispar*, L. [*R.A.E.*, A, xix, 156] and *Coccobacillus ellingeri* from those of *Pyrausta nubilalis*, Hb., were, however, found to be from 10,000 to 100,000 times as virulent as any other bacteria pathogenic to *G. mellonella*. Similar results were obtained with the larvae of *P. nubilalis*, a dose equivalent to 1–4 bacteria of either of the highly virulent strains being sufficient to kill them in 24 hours, and it was found possible to infect them *per os*, all attempts to infect those of *G. mellonella* by this means having failed up to the present.

Ozols (E.). **Hessenes mušas** (*Mayetiola destructor* **Say**) **masu savairošanās gadījumi Latvijā.** [Outbreaks of the Hessian Fly (*Mayetiola destructor* Say) in Latvia. (*In Lettish.*)]—*Lauksaimniecibas menesraksts*, no. 6, reprint 19 pp., 8 graphs, 21 refs. Riga, 1930. (With a Summary in English.)

Severe outbreaks of *Mayetiola destructor*, Say (Hessian fly), occurred in Latvia in 1876 and 1929 and to a less extent in 1924. The effect of

meteorological conditions on them is discussed. They followed years of abundant precipitation during May, June and August, and the years in which they occurred were characterised by a cool spring (low temperature in April) and abundant precipitation in May.

[ANDREEVA (N. V.).] **Андреева (Н. В.). The Hemp Worm (Maize Moth), as a Pest of cultivated Hemp.** [*In Russian.*]—8vo, 16 pp., 10 figs. Orel, 1930.

The maize moth [*Pyrausta nubilalis*, Hb.] is a very serious pest of hemp throughout the Russian Black Soil zone, but the intensity of infestation varies considerably in different districts, as it is greatly affected by temperature and rainfall. Well-developed hemp is usually more severely infested. Maize is seldom attacked, even when growing near hemp. The larvae, pupae and adults are briefly described. In the northern districts of the zone there is one generation a year. The adults appear at the beginning of June and are especially abundant in early July. The average adult life under cage conditions was 20–25 days for females and 10–15 for males. Oviposition takes place 6–8 days after emergence and covers a period of 8–12 days ; the eggs are laid on the lower surface of the leaves in batches of 12–32, preference being shown for hemp and millet. The number of eggs deposited by a female averages about 100, but under favourable conditions as many as 300 may be laid. In the Orel Government in 1929, the first eggs were found on 6th July and the last on 5th August. The larvae, which hatch in 5–6 days, feed for about two weeks on the surface of the leaves, and then bore into the stems, often migrating from one to another. After 26–30 days, they enter hibernation in the stems. In the spring the mature larvae pupate, while the others resume feeding until development is completed. If the spring is dry, the larvae do not pupate until the necessary degree of humidity is reached. In 1929, the first pupa was found on 19th May, and the last on 16th July, the maximum number occurring about mid-June. The pupal stage averages 19 days.

Infestation of the stems usually occurs on strong, well-developed plants, cultivated in well-manured soil ; whereas infestation of the inflorescence occurs on low and poorly developed plants, and results in the drying up and eventual dropping of the inflorescence. The stems may be injured either near the top, which results in a loss in the yield of seeds, or in the middle, which decreases the yield of both seeds and fibre. Usually only one larva occurs in a stem.

The usual remedial measures are recommended, including early sowing of hemp ; and removal and destruction of crop remnants after harvest, followed by ploughing.

[KOZHANCHIKOV (I. V.).] **Кожанчиков (И. В.). Les races et les modifications du *Phylloxera* (*Peritymbia*) *vitifolii* Fitch. Essai critique.** [*In Russian.*]—*Rev. russe Ent.*, xxiv, no. 1–2, pp. 69–77, 16 refs. Moscow, 1930.

Some of this information has already been noticed [*R.A.E.*, A, xvi, 664]. The author's investigations in Transcaucasia, carried out in 1926–28, confirmed the view that the larvae of *Phylloxera* hibernate in the first and second instars, and showed that the bristles of those of the second instar are longer, a fact that was ignored by Börner. It was

also found that there is a direct relation between the size of the Aphids, irrespective of their age, and that of the bristles. Large Aphids, taken from young roots and bred by the author in the laboratory on old roots of much inferior nutritive quality, produced in the third generation individuals with shorter bristles. The author believes, therefore, that the difference in the length of the bristles does not offer a sufficient basis for distinguishing races of *Phylloxera*. He also does not agree with Börner that the races differ biologically either in their manner of infesting vines or in the susceptibility of the latter to their attack; the literature on the subject is briefly discussed.

[ANDREEVA (N. V.).] **Андреева (Н. В.). The Hemp Flea-beetle and its economic Importance.** [*In Russian.*]—*Bull. Sev.-Chernoz. oblastn. sel.-khoz. opuitn. Stantz.* [*Bull. North Black Soil Zone Reg. Agric. Expt. Sta.*], no. 1, pp. 20–23. Orel, 1930.

This is a popular account of the bionomics of the flea-beetle [? *Psylliodes attenuata*, Koch] that attacks hemp [*Cannabis sativa*] in the northern districts of the Black Soil zone of Russia. The whole crop is sometimes destroyed and has to be resown. There is one generation a year. The adults hibernate in débris or cracks in the soil and begin to emerge at the beginning of May, being particularly abundant in July and disappearing about the middle of August. Each female may lay about 300 eggs, which are deposited in the upper layer of the soil. The larvae hatch in 8–10 days and feed on small roots of hemp, pupating in the soil. The total life-cycle from egg to adult is completed in 52–70 days. The chief injury is caused by the adults, which skeletonise the leaves of hemp and hops, passing to these crops from nettles [*Urtica dioica*], on which they concentrate at first. Laboratory investigations show that infestation retards the development of the plants; the stems of the hemp, from which the fibre is obtained, are shorter by 7 to 37 per cent., and the loss in yield of seeds varies from 13 to 47 per cent.

Control measures, which are briefly reviewed from the literature, include: crop rotation; early sowing in order that the plants should be more advanced when the beetles appear; dense sowing if an outbreak is expected; repeated spraying of the young shoots in the spring with nicotine sulphate, 1 : 500; and spraying nettles with arsenicals when the beetles concentrate on them before migrating to hemp.

[KHARIN (S. A.).] **Харин (С. А.). The Control of Pests on Soviet Farms in Central Asia in 1929.** [*In Russian.*]—*Khlopkovoe Delo*, ix, no. 7–8, pp. 867–878. Tashkent, 1930.

An account is given of the organisation of the control of pests in the cotton-growing districts in Ferghana and Tadzhikistan, with notes on their distribution and incidence in 1929, the species involved including: *Aphis laburni*, Kalt., *A. gossypii*, Glov., *Macrosiphum* (*Acyrthosyphon*) *gossypii*, Mordv., *Tetranychus telarius*, L. (*Epitetranychus althaeae*, v. Hanst.), *Trifidaphis phaseoli*, Pass., and *Euxoa segetum*, Schiff., on cotton; *Laphygma exigua*, Hb., and locusts on cotton and lucerne, which was also attacked by *Hypera* (*Phytonomus*) *variabilis*, Hbst.; and *T. telarius* and *Epilachna chrysomelina*, F., on cucurbits. *T telarius* bred in numbers on weeds and only infested crops where weeds were abundant.

[Nikol'skiĭ (V. V.).] **Никольский (В. В.). An Outbreak of *Caradrina* in Central Asia and a new Method of controlling this Pest.** [*In Russian.*]—*Khlopkovoe Delo*, ix, no. 7–8, pp. 879–889, 2 figs., 1 ref. Tashkent, 1930.

In 1930, an unusually severe outbreak of the second generation of *Laphygma* (*Caradrina*) [*exigua*, Hb.] occurred in Turkmenistan over an area of nearly 45,000 acres; the third generation was, however, considerably less abundant owing to a marked decrease in the reproductive capacity of the females.

Observations showed that in this region *L. exigua* has at least five generations a year; the stage in which hibernation takes place is unknown. The eggs, larvae and adults are described. The adults live about 2–2½ weeks and are on the wing from early spring till late in the autumn; the oviposition period, which starts 1–3 days after emergence, lasts 10–15 days. The eggs are usually laid in batches of up to 250 on the leaves and are protected by a felt-like covering. A female usually deposits about 430 eggs in 24 hours. In 1930 the total number laid by a female of the second generation reached 1,700, as compared with 500 by those of the third. The first generation develops chiefly on weeds and on lucerne during the flowering period. The second generation eggs hatch in 2–3 days, and the third in 4–5. The larvae at first remain in groups and skeletonise the leaves under a common web; they then gradually disperse over the plant and feed singly. Damage to the leaves of cotton by larvae of the first four instars is negligible, but serious injury is caused by the mature individuals, which feed on the leaves, bracts, buds and bolls, and sometimes on the stems. They also occurred on beet, cabbage, lucerne, etc. About the middle of the day they drop or descend to the ground, and spend a certain time on or in the soil, where they remain for a large part of the night. In several instances they were observed migrating in large numbers across roads. In 1930, the larval stage lasted 16–18 days, and the total life-cycle of the second generation from egg to adult averaged 25–28. Pupation occurs on or in the soil close to the food-plant, the majority of the pupae being found at a depth of about 2–4 ins.

Over 900 adults were usually caught each night by means of two powerful electric lights, the moths falling into a large metal funnel placed under the light, and thence into a jar containing methylated spirit. Spraying with 1½ lb. Paris green and 3 lb. lime to 125 gals. water killed all the larvae in 4 days. Dusting with calcium arsenite at the rate of about 18 lb. to the acre destroyed about 80 per cent. on cotton and 99 per cent. on weeds growing in ditches around the fields. Flooding killed most of the larvae [*cf. R.A.E.*, A, xviii, 526], and the resulting hard crust on the soil prevented the adults from emerging from the pupae, but this measure can only be employed during very severe outbreaks, where water is scarce. A moist bait of white arsenic and bran, 1 : 30, killed 52 per cent. of the larvae of the second generation in cotton fields and 92 per cent. on weeds in irrigation ditches.

[Novitzkiĭ (—).] **Новицкий (—). On the Autumn Spraying of Cotton against the Cotton Aphis.** [*In Russian.*]—*Khlopkovoe Delo*, ix, no. 7–8, pp. 890–893. Tashkent, 1930.

As sprays of soft soap have proved very effective against the cotton aphis [*Aphis gossypii*, Glov.] in Uzbekistan, special field experiments were carried out on the effect of the insecticide on the quality of the

cotton fibre. Sprays of 3 and 4 lb. soap to 12 gals. water killed 91·5 and 95·1 per cent. of the Aphids, respectively, but the treated cotton showed a decrease in the yield of satisfactory lint, which was also shorter and more brittle than that from untreated cotton [but *cf. R.A.E.*, A, xix, 160]. The author considers, therefore, that the spray should only be applied before the bolls have opened, and that attention should be given to the possibility of controlling the Aphid by nicotine dusts.

DIEHL (H. C.), RYALL (A. L.) & FAHEY (J. E.). **Additional Solvents for increasing the Efficiency of Hydrochloric Acid as a cleaning Solution for Apples.**—*Northwest Fruit Grower*, August 1930, pp. 8, 10, 17–18.

DIEHL (H. C.) & FAHEY (J. E.). **Suggestions for the Use of additional Solvents for increasing Efficiency of Hydrochloric Acid as a cleansing Solution for Apples.**—2 pp. multigraphed. Wenatchee, Wash., U.S. Dept. Agric. [1930.]

Following on recent studies in the possibilities of increasing the efficiency of washing solutions for sprayed fruits [*R.A.E.*, A, xviii, 647], details are given of further experiments and recommendations for the use of salt and kerosene emulsion. Until the optimum proportions have been more accurately determined, from 1 to 2 per cent. (by weight) of salt in the hydrochloric acid solution is suggested as being adequate and harmless to the fruit. Kerosene emulsion is recommended only in cases where other cleaning methods or solvents have failed to remove the residue. The formula suggested for such an emulsion is 1 U.S. gal. kerosene, 1⅓ lb. kaolin and ½ U.S. gal. water, and the strength recommended is 1½ gals. in every 100 gals. of the washing solution. With the increased efficiency resulting from the use of salt or salt and emulsion with the acid, it is often possible to reduce the temperature from that of 110° F. otherwise recommended to 90–100° F. without any loss of efficiency.

CARTER (R. H.). **Solubilities of Fluosilicates in Water.**—*Indust. Engng. Chem.*, xxii, p. 886 (reprint 4 pp.). Easton, Pa., August 1930.

Fluosilicates are relatively cheap as they may easily be formed from silicon tetrafluoride, which is a by-product in the manufacture of fertiliser from phosphate rock, but data collected from the literature and given in a table show that in most cases their solubilities are so high that their use as insecticides is very limited. Highly soluble substances are not only easily washed off by rain but also scorch the foliage of plants. Three or four compounds have a relatively low solubility and might be used without danger under certain climatic conditions. They include barium, potassium and sodium fluosilicates; the solubilities of these compounds over a wide range of temperature were therefore determined, and the results are tabulated. All fluosilicates in solution, however, give an acid reaction, and for this reason even the more insoluble ones may cause foliage injury. A comparison of commercial calcium fluosilicate and "calcium fluosilicate compound" with pure calcium fluosilicate made in the laboratory showed that the commercial samples were not of a high degree of purity, and that the pure compound is too soluble for insecticidal use.

Carter (R. H.). **Fluoaluminates of the Alkali Metals.**—*Indust. Engng. Chem.*, xxii, p. 888 (reprint 6 pp.), 12 refs. Easton, Pa., August 1930.

One of the fluoaluminates of an alkali metal, cryolite (Na_3AlF_6), has given good experimental control of several kinds of insect pests against which arsenicals are not entirely satisfactory. The literature on the preparation of similar compounds is discussed. From an economic standpoint, the other available compounds of this type are potassium hexafluoaluminate (K_3AlF_6), ammonium hexafluoaluminate ($(NH_4)_3AlF_6$) and lithium hexafluoaluminate (Li_3AlF_6). The method of preparing these compounds in the laboratory is described, and some of their physical and chemical properties are shown in a table. Various methods for the large-scale production of potassium hexafluoaluminate are discussed. When properly washed during the process of manufacture, suspensions or solutions of these compounds in water give a practically neutral reaction, and as their solubility is low, they are less likely to scorch plant foliage than such compounds as the fluosilicates. Considering their fluorine content alone as a measure of toxicity, they compare favourably with the fluosilicates and metallic fluorides, which have a definite insecticidal value, supposedly due to this element. Further practical experiments are now in progress to determine the insecticidal value of these compounds and their effect on plants.

Smith (C. M.) & Murray (C. W.). **The Composition of commercial Calcium Arsenate.**—*Indust. Engng. Chem.*, xxiii, no. 2, pp. 207–208, 4 refs. Easton, Pa., February 1931.

The following is largely taken from the authors' summary : Sixteen brands of recently manufactured calcium arsenate were analysed in detail, the results tabulated and the average composition of this insecticide determined. The presence of a basic arsenate of undetermined composition is definitely established. The average product contains 80 to 85 per cent. of what is probably a mixture of tricalcium arsenate and this basic arsenate, together with about 6·5 per cent. each of calcium hydroxide and calcium carbonate and small amounts of incidental impurities. The individual products may, however, differ rather widely from these average figures.

Clark (E. P.). **Deguelin. I. The Preparation, Purification and Properties of Deguelin, a Constituent of certain tropical Fish-poisoning Plants.**—*J. Amer. Chem. Soc.*, liii, pp. 313–317, 4 refs. Easton, Pa., 1931.

A description is given of the procedure used in the preparation and purification of deguelin ($C_{23}H_{22}O_6$) [*cf. R.A.E.*, A, xix, 102], a dimethoxylactone that is an active constituent of derris and cubé roots [xviii, 376], the leaves of *Tephrosia* (*Cracca*) *vogelii* and the roots of *T.* (*C.*) *toxicaria* [xviii, 690]. Some of its physical and chemical properties are discussed. The data upon which the statements regarding its composition and nature have been based are also given, and the preparation of the derivatives, dehydrodeguelin, dehydrodeguelone and deguelic acid are described.

CLARK (E. P.). **A Relation between Rotenone, Deguelin and Tephrosin.**—*Science*, lxxiii, no. 1879, pp. 17–18. Lancaster, Pa., 2nd January 1931.

A study of the chemistry of rotenone, deguelin and tephrosin [*cf.* *R.A.E.*, A, xix, 102] has supported the suggestion that these substances are more or less closely related [xviii, 376]. Under the treatment described rotenone yields first dehydrorotenone ($C_{23}H_{20}O_6$), then a hydroxy acid ($C_{23}H_{24}O_8$) and lastly derric acid ($C_{12}H_{14}O_7$). Under similar treatment deguelin yields dehydrodeguelin ($C_{23}H_{20}O_6$), deguelic acid ($C_{23}H_{24}O_8$) and then derric acid. The loss of one molecule of water from tephrosin gives dehydrodeguelin. Thus derric acid constitutes one half of the molecule of rotenone, of deguelin and of tephrosin.

DRAKE (N. L.) & SPIES (J. R.). **Mannitol from** *Haplophyton cimicidum.*—*J. Amer. Chem. Soc.*, lii, p. 3739. Easton, Pa., 1930.

During the course of an investigation of the reported insecticidal properties of the plant, *Haplophyton cimicidum,* mannitol was isolated and identified. The crude crystalline material, separating from the alcoholic extract of this plant, from which pure mannitol was obtained, represented approximately 0·75 per cent. of the weight of the plant on a dry basis. The substance was identified by means of its tribenzacetol and hexacetyl derivatives.

SMITH (C. R.). **Neonicotine and Isomeric Pyridylpiperidines.**—*J. Amer. Chem. Soc.*, liii, pp. 277–283, 6 refs. Easton, Pa., 1931.

An account is given of a chemical study of neonicotine and isomeric pyridylpiperidines, the toxicities of which have already been recorded [*R.A.E.*, A, xix, 100].

ROARK (R. C.). **The Use of Rosin in Insecticides and Disinfectants.**—*Proc. Amer. Soc. Testing Materials*, xxx, pt. 2, reprint 2 pp. Philadelphia, Pa., 1930.

Resin is used in many formulae for making adhesives for fly papers, and seven of these are given. It is also used in adhesives for banding trees. In the form of resin soap, it is valuable as an emulsifying agent and as a " wetter " and spreader for nicotine and other insecticides. Mixtures of fish-oil and resin soap are especially effective for these purposes.

WEBB (J. L.) & MERRILL (F. A.). **Cotton or Weevils.**—*Misc. Pub. U.S. Dept. Agric.*, no. 35 (revd.), 16 pp., 10 figs., 2 refs. Washington, D.C., 1930. [Recd. 1931.]

A popular account is given of the bionomics and control of the cotton-boll weevil [*Anthonomus grandis*, Boh.] in the United States.

PAPERS NOTICED BY TITLE ONLY.

WATZL (O.). **Beobachtungen über den Einfluss verschiedener Zuchttemperaturen auf die Häutungen der Mehlwürmer (Col., Tenebr.).** [Observations on the Influence of various Temperatures during Breeding on the Moults of *Tenebrio molitor*, L.]—*Z. wiss. Insekt Biol.*, xxv, no. 10, pp. 194–198. Berlin, 31st December 1930.

OUDEMANS (A. C.). **Acarologische Aanteekeningen civ, cv, cvi.** [Notes on Mites, civ, cv, cvi.]—*Ent. Ber.*, viii, nos. 175, 176, 177, pp. 135–140, 157–172, 189–204. Amsterdam, 1st September, 1st November 1930, 1st January 1931.

PHILLIPS (W. J.) & BARBER (G. W.). **The Corn Earworm** [*Heliothis obsoleta*, F.] **as an Enemy of Field Corn** [Maize] **in the Eastern States.**—*Fmrs'. Bull. U.S. Dept. Agric.*, no. 1651, 17 pp., 17 figs. Washington, D.C., January 1931. [Revision of no. 1310, *R.A.E.*, A, xi, 380.]

MOULTON (D.) & STEINWEDEN (J. B.). **A new** *Taeniothrips* [*gladioli*, sp. n.] **on** *Gladiolus* [in Ontario and Ohio].—*Canad. Ent.*, lxiii, no. 1, pp. 20–21, 1 fig. Orillia, Ont., January 1931.

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Studies of Insect Pests and related Matters.—*43rd Ann. Rep. S. Carolina Expt. Sta. 1929–30*, pp. 59–74, 6 figs. Clemson Coll., S.C., December 1930.

Some of the pests observed in South Carolina in 1930 were recorded in previous reports [*R.A.E.*, A, xviii, 215, 582]. Chiefly owing to the cold weather during the early stages of its development, the oriental fruit moth [*Cydia molesta*, Busck] caused much less injury to peaches in 1930 than in 1929. The life-history studies described show that it has 2 complete and 3 further partial generations in a year. The feeding period of larvae in apples lasted 24 days as compared with only 12 for those developing in peaches. The parasite, *Macrocentrus ancylivora*, Roh., was introduced from New Jersey in larvae of *C. molesta* and *Ancylis comptana*, Fröhl., and a total of 9,062 adults were reared and liberated. Seasonal history studies showed that there were three generations and probably a partial fourth of the codling moth [*Cydia pomonella*, L.] during the year, the dates of oviposition and adult emergence being given. A cold spring and a hot and dry mid-summer were very unfavourable for the development of the Mexican bean beetle [*Epilachna corrupta*, Muls.], and the injury it caused to beans was relatively small for the first time since 1921. Its distribution and probable spread in the State is discussed.

In small scale experiments against *Calandra oryzae*, L., infestations in stored maize were completely controlled by the following dusts, used at the rate of ½ oz. to a bushel: sodium fluosilicate; copper (metallic) 18 per cent., inert ingredients 82 per cent.; monohydrated copper sulphate 19 per cent., tri-calcium arsenate 17½ per cent., inert ingredients 64½ per cent.; mercury (metallic) 3½ per cent., inert ingredients 96½ per cent.; and sulphur. In studies on field pests of maize, a second generation of *Sphenophorus* (*Calendra*) *callosus*, Ol., was reared in the laboratory during the season. The southern corn stalk borer [*Diatraea crambidoides*, Grt.] again had three general emergence periods for the year, the first and second overlapping slightly and the second and third over some 26 days, so that the moths were present from 8th May to 20th September. Some of the larvae of even the first remained quiescent during the summer, later assuming the usual overwintering form. In the insectary females laid on an average 313 eggs each, with a maximum of 664. The pupal period averaged 10½ days. Of the second generation eggs, 40 per cent. were parasitised, probably by *Trichogramma minutum*, Riley. In one heavily infested plot of maize, 94 per cent. of the stalks were injured, and 79 per cent. contained overwintering larvae, the borer population being 2,380 individuals to 1,000 stalks. Further investigation showed that 46 per cent. of the borers were below and the remainder above the surface of the soil. Hibernation studies show that the borers are able to pass the winter as well in stubble ploughed out on the surface of the ground as in that left standing in the field; ploughing under the infested stubble and completely covering it is therefore recommended. The ants, *Pheidole vinelandica*, For., and *Ponera trigona* var. *opacior*, For., were observed preying on the pupae.

Eddy (C. O.) & Nettles (W. C.). **The Bean Leaf Beetle.**—*Bull. S. Carolina Agric. Expt. Sta.*, no. 265, 25 pp., 8 figs., 12 refs. Clemson Coll., S.C., May 1930. [Recd. March 1931.]

The adults and larvae of *Cerotoma trifurcata*, Forst. (bean leaf-beetle) [*cf. R.A.E.*, A, xviii, 17, 473] cause much damage to seedling beans,

cowpeas and soy-beans, and occasionally to well-grown or mature cowpeas, throughout South Carolina. It is a native species, occurring throughout the eastern United States. Overwintered females laid an average of about 460 eggs, with a maximum of 1,432, those of the first and second generations laying less than half as many. The egg stage averaged 11 days, and the three larval instars and the prepupal and pupal stages each about $4\frac{1}{2}$–$7\frac{1}{2}$, the whole life-cycle occupying a maximum of 54 and a minimum of 35. Adults hibernate in rubbish or in the soil. Three partial generations occurred, some females of each generation hibernating.

Celatoria diabroticae, Shim., parasitised about 20 per cent. of the adults. The pupae were usually found in the soil and occasionally on the leaves, the pupal period averaging 9 days in July and August 1929. The adult beetles are also attacked by a fungus and the larvae by mites and Nematodes. Severe storms reduce the numbers of the pest for short periods. Heavily infested fields should be ploughed immediately after harvesting, and clean cultivation should be practised in the vicinity of the food-plants. Injury to mid-season seedlings can be minimised by a regulation of planting dates. Large areas of infested seedling beans, cowpeas and soy-beans should receive at least one application of 1 lb. magnesium arsenate and 50 U.S. gals. water. A dust of 1 lb. magnesium arsenate and 3 lb. hydrated lime can be applied to mature cowpeas, care being taken to avoid arsenical residue. It is suggested that the poison should not be applied after the pods have begun to form.

CARTWRIGHT (O. L.). **The Rice Weevil and associated Insects in Relation to Shuck Lengths and Corn Varieties.**—*Bull. S. Carolina Agric. Expt. Sta.*, no. 266, 28 pp., 8 figs., 9 refs. Clemson Coll., S.C., June 1930. [Recd. March 1931.]

The following is taken from the author's abstract : A three years' study of maize infestation at Florence, South Carolina, indicates that about 95 per cent. of the ears and 10 per cent. of the grains were infested or had been infested by insects by the time the maize was removed from the field. Entrance by *Heliothis obsoleta*, F. (corn earworm) was followed by increased infestation by *Pyroderces rileyi*, Wlsm. (pink cornworm), *Sitotroga cerealella*, Oliv. (angoumois grain moth), *Calandra* (*Sitophilus*) *oryzae*, L. (rice weevil), and the flour beetles, *Cathartus cassiae*, Reiche, and *Tribolium castaneum*, Hbst. (*ferrugineum*, F.). The length of shuck beyond the tip of the ear proved to be an important factor in the development of infestation ; a long shuck was of value regardless of entrance by *H. obsoleta*, infestation by each insect varying inversely with the length of the shuck. *H. obsoleta* entered 97·3 per cent. of the ears in 1928 and 96·5 per cent. in 1929. A difference of 3 ins. in the length of the shuck decreased damage by *H. obsoleta*, *P. rileyi*, *C. oryzae* and *S. cerealella* by 5–10, 10, 23 and 6 per cent. respectively. Varietal resistance to all the pests except *Calandra* was negligible, and only one or two varieties were relatively unattractive to the latter.

CAMP (A. F.) & WILMOT (R. J.). **Fumigation Research in Florida.**—*Mon. Bull. Florida Pl. Bd.*, xv, no. 5–8, pp. 1–35, 28 figs., 1 ref. Gainesville, Fla., 1931.

The work described was carried out in view of irregular results experienced in Florida during the fumigation of imported nursery stock,

fruits, vegetables, etc., with hydrocyanic acid gas, including insufficient insect mortality and, occasionally, severe scorching of the material. The following is the authors' summary: An investigation of fumigation as applied in the field showed that failure to obtain insect kill was primarily due to low concentrations of the gas. Further investigations showed that the low concentrations are largely due to leakage of the gas out of the fumigatorium and to absorption by the load, both of these losses being very large. Irregular results in obtaining insect control were found to be largely due to a lack of penetration of the gas into the load. Methods of offsetting these difficulties are reported, including a metal fumigatorium with an agitating system and a fractional method of applying the fumigant so as to compensate for absorption. Some typical data are given on the toxicity of hydrocyanic acid gas to certain insects.

Back (E. A.) & Cotton (R. T.). **The Control of Moths in Upholstered Furniture.**—*Fmrs'. Bull. U.S. Dept. Agric.*, no. 1655, 32 pp., 35 figs. Washington, D.C., February 1931.

An account is given of the essential factors affecting the development and control of *Tineola bisselliella*, Humm. (webbing clothes moth) and *Tinea pellionella*, L. (case-making clothes moth) as pests of upholstered furniture. Their biology is briefly summarised, that of *T. pellionella* being very similar to that of *Tineola bisselliella* [*R.A.E.*, A, xvi, 202]. The nature of the damage is described, cotton batting preventing much of the injury caused by larvae feeding below the covers. Preventive measures carried out by manufacturers, furniture dealers and warehousemen are described. The use of paradichlorobenzene is recommended for safe and economical application in houses where skilled fumigators are not available. The covers of a chair should be well treated with 2 or 3 lb. of the best grade crystals and the chair wrapped in several old blankets, waterproofed bags or cartons treated with shellac and left for several days at a temperature of 70° F. or over. Infestation in a room left unoccupied for several weeks may be prevented by 8 or 10 lb. paradichlorobenzene scattered over papers on the floor.

Uichanco (L. B.). **Water-and-Oil Treatment against Soil-inhabiting Termites and Ants.**—*Philipp. Agric.*, xix, no. 9, pp. 601–603, 5 refs. Laguna, P.I., February 1931.

In the Philippine Islands, the cost of using metal shields on concrete bases for protecting buildings against subterranean termites is prohibitive. The following method, which is simple and inexpensive, has been successfully used, in cases of tunnels built up along the concrete walls of a building to the wooden parts above, against *Coptotermes vastator*, Light, and *Termes* spp. :—A shallow trench, dug in the soil where the tunnels were connected, was filled with water until the soil was thoroughly drenched and absorption became slow. Enough waste engine oil or kerosene to make a very thick film on the surface of the water was then poured into the trench. As the water soaked downward, the oil was drawn by surface tension under the ground and through the communication galleries into the nest, which did not have to be found before treatment. Previous trials with oil

alone were unsuccessful. One treatment is sufficient to destroy an entire colony. This method was also successfully applied for treating nests of ground-inhabiting species of ants. The ground in which the openings of the nests were found was soaked with water before applying the oil, and more water was then added to aid its distribution. Mineral oils should not, however, be used near trees or valuable plants.

LINFORD (M. B.). **Yellow-spot Disease of Pineapples transmitted by** *Thrips tabaci* **Lind.**—*Science*, lxxiii, no. 1888, p. 263, 2 refs. New York, N.Y., 6th March 1931.

This is a summary of evidence, a detailed account of which is to be published shortly, that *Thrips tabaci*, Lind., is a major vector of yellow-spot disease of pineapple in Hawaii. It derives the virus from weeds, the most important of which is *Emilia flammea*, owing to its abundance in pineapple fields and the rapidity with which the thrips breed on it. A virus disease of *E. flammea*, which shows both ring-spot and mosaic characteristics, is closely associated with yellow-spot of pineapple in the field, and thrips from diseased *Emilia*, when fed on healthy pineapple and *Emilia* seedings, transmitted the virus, producing yellow-spot in pineapple and ring-spot mosaic in the weed. Thrips of strains originating from individuals reared from the moment of hatching on uninfected plants were not infective, but became so after feeding on diseased plants. The feeding of *T. tabaci* on pineapple appears to be incidental, and it is therefore probable that natural transfer of the virus from pineapple to pineapple is relatively uncommon.

SHAPOVALOV (M.) & BEECHER (F. S.). **Experiments on the Control of Tomato Yellows.**—*Tech. Bull. U.S. Dept. Agric.*, no. 189, 23 pp., 4 pls., 1 fig., 44 refs. Washington, D.C., July 1930. [Recd. March 1931.]

An account is given of experiments carried out in California on the control of tomato yellows, a disease etiologically identical with curly top of sugar-beet, the virus of which is carried by *Eutettix tenella*, Baker [*R.A.E.*, A, xvi, 682].

The following is taken from the authors' summary : Highly effective and economical control measures for the disease have not yet been found. No sprays or dusts have proved of value in destroying or repelling the leafhopper. Measures for strengthening the plant, which are given, are of slight benefit, but in localities where serious outbreaks are likely to occur these should not be neglected. In certain districts the time of planting may be varied to advantage. Temporary muslin tents, which protect the plants from infestation by *Eutettix* and create conditions less favourable for the development of the disease, have given the most satisfactory results, being of primary value in the case of the summer crop until about the end of June. The use of a tall-growing plant, such as sunflower, for shading is recommended where the relatively high cost of muslin tents is not warranted. The development of highly resistant varieties of tomato may be the ultimate solution of the problem. Certain varieties appear to be capable of slight resistance, which seems to be insufficient under conditions most favourable to the disease.

SLEESMAN (J. P.) & GUI (H. L.). **The Onion Maggot.**—*Bi-m. Bull. Ohio Agric. Expt. Sta.*, no. 149, pp. 35–41, 3 figs. Wooster, Ohio, 1931.

An account is given of the bionomics of the onion maggot [*Hylemyia antiqua*, Mg.] in Ohio, where three generations occurred in 1930. The injury is described. A lubricating oil emulsion (2 per cent. oil) in combination with Bordeaux mixture (4–6–50) has proved effective against the first generation eggs. The first application should be made, under 20 lb. pressure at the rate of 150 U.S. gals. to the acre, as soon as the young onion plants are readily observed in the row and should be followed by 3 or 4 others at weekly intervals, care being taken that the ground one inch on either side of the row is sprayed, so that the majority of eggs may be covered by the insecticide. Cultivation tends to scatter the eggs and should be postponed until the spray has been applied. Of the two types of power sprayers generally used, the one suitable for use over large areas is described. Experiments indicate that injury to the foliage may be expected if the spray is applied when humidity is high, but such injury will seldom have much effect on the plants. It is most serious when periods of low temperature and high humidity continue for 3 or 4 days after spraying. When the temperature is near freezing point and the humidity is fairly high, the spray should be postponed.

LANE (M. C.). **The Great Basin Wireworm in the Pacific Northwest.**—*Fmrs.' Bull. U.S. Dept. Agric.*, no. 1657, 8 pp., 5 figs. Washington, D.C., February 1931.

Much of this information on *Corymbites* (*Ludius*) *noxius*, Hyslop, which is a very serious pest of wheat in parts of Washington, Oregon and Idaho, has already been noticed [*R.A.E.*, A, xiii, 243]. The nature of the injury it causes to spring and winter wheat is described. Its natural enemies are of little importance in control, though the protection of birds, particularly *Otocoris alpestris* (Columbian horned lark), is recommended. The value of clean summer fallow, to deprive the first season larvae of their food, is emphasised. Seed for spring wheat treated with copper carbonate dust against smut appears to germinate rapidly and produce more vigorous stands of wheat, which are therefore less affected ; an extra 10 lb. per acre should be sown to allow for some thinning by the wireworms. It is unwise to harrow winter wheat in the spring, as this practice often injures the young plants and also loosens the soil so that the wireworms can more easily attack them.

BREAKEY (E. P.). **Additional Notes on the natural Enemies of the Iris Borer,** *Macronoctua onusta* **Grote (Lepidoptera).**—*Ann. Ent. Soc. Amer.*, xxiv, no. 1, pp. 40–44, 1 ref. Columbus, Ohio, March 1931.

Observations on the natural enemies of the iris borer, *Macronoctua onusta*, Grote, in Wisconsin [*R.A.E.*, A, xviii, 75] were continued in 1929. Late in the season, which was drier than the previous one, there was a reduction in the borer population, and difficulty was experienced in collecting even 100 caterpillars. Of these, 8 were attacked by Dipterous parasites, namely, the Tachinid, *Ceromasia* (*Masicera*)

senilis, Mg., and *Sarcophaga rapax*, Wlk. (*helicis*, Tns.), and 6 were destroyed in the pupal stage by Hymenopterous parasites [*cf. loc. cit.*], namely, the Ichneumonids, *Amblyteles laetus*, Brullé, and *A. rubicundus*, Cress., and the Pteromalid, *Psychophagus omnivorus*, Wlk. One larva was attacked by the fungus, *Beauveria* (*Sporotrichum*) *globulifera*.

Satterthwait (A. F.). **Key to known Pupae of the Genus** *Calendra*, **with Host-plant and Distribution Notes.**—*Ann. Ent. Soc. Amer.*, xxiv, no. 1, pp. 143–172, 3 pls. Columbus, Ohio, March 1931.

The pupae of the species of *Sphenophorus* (*Calendra*) are described, with a key and notes on their distribution in America, and lists of the food-plants arranged under the weevils and under the plants are appended.

Smith (L. M.). **The Snowy Tree Cricket and other Insects injurious to Raspberries.**—*Bull. California Agric. Expt. Sta.*, no. 505, 38 pp., 16 figs., 10 refs. Berkeley, Cal., December 1930.

Oecanthus niveus, DeG. (snowy tree cricket) has been the subject of study during 1927–29 in California, where there are two physiological races [*R.A.E.*, A, xiii, 623]. The eggs are deposited in punctures in long rows in the raspberry canes through the wood and diagonally across the pith, the egg-cavities being closed by a plug of chewed wood. The first eggs were found in the field in August, and the first nymphs appeared on 18th April. The nymphs feed on a variety of plant and animal tissue, and in the first three of the five instars cause practically no damage to raspberry. The average nymphal period was 55½ days. The adults are active at night ; in the morning they appear on the sunny side of the rows, but in the afternoon they seek the shady side. They are found in the upper half of the bushes only, and oviposition nearly always occurs in the uppermost third of the canes. They appear in the field about mid-July and live until severe frosts begin. The damage to raspberry becomes apparent in the inter-crop period, usually fairly early in July. The fourth and fifth instar nymphs, and particularly the adults, feed almost exclusively on the flowers, devouring generally a few stamens or pistils and then moving to a fresh flower. The berries resulting from such flowers have fewer than the normal number of drupelets. More flowers may be produced, but when the insects are particularly numerous they consume all flowers, including secondary ones.

Natural enemies are an important factor in the control of *O. niveus*. Among these are four Hymenopterous egg-parasites, *viz.*, the Eurytomid, *Macrorileya oecanthi*, Ashm. [xviii, 538], which is the most effective, the Scelionid, *Cacellus oecanthi*, Riley, *Eupelmus* sp., and a Eulophid, *Aprostocetus* sp. Each larva of the last three species destroys a single egg. A large, orb-weaving spider is a useful predator in some localities.

In the normal course of pruning raspberry canes, many eggs are removed with the prunings ; 50 to 75 per cent. may be disposed of in this way. All prunings should be burnt before 15th March, that is, before the eggs hatch. Of several proprietary sprays tested, the best only killed about 30 per cent. of the crickets. Dormant oils proved useless as ovicides, and lime-sulphur almost so. The use of arsenical sprays or dusts is impracticable, as it would be necessary to treat the

bushes while they are bearing. Calcium cyanide and nicotine dusts were tried, but were finally abandoned owing to high cost, difficulty of handling and great variation in toxicity. Complete control, however, was obtained with a dust composed of 70 per cent. sodium fluosilicate and 30 per cent. diatomaceous earth, applied at the rate of about 50 lb. to the acre with a rotary fan blower. The dust should be applied to the uppermost third of the bushes, in the inter-crop period ; only one side of the row requires dusting, and no berries should be picked for ten days afterwards. The dust should not be applied in the early morning or evening or when the plants are wet, as injury may result. This treatment should not be necessary in two consecutive years ; it should also be used against *O. californicus*, Sauss., when numerous.

Other insect pests found attacking raspberries included *Otiorrhynchus* (*Brachyrrhinus*) *sulcatus*, F. (black vine weevil), the larvae of which burrow into the soil and feed on the roots, severely injuring the plants and sometimes girdling them. A proprietary mixture of dried, ground apple pulp and sodium fluosilicate proved a successful bait, attracting the weevils from the tops of the bushes to the ground ; it should be applied as soon as most of the weevils have emerged from the soil, that is, about 1st May, about 75 lb. to the acre being scattered by hand along the centre of the row. The smaller *O.* (*B.*) *rugoso-striatus*, Goeze, occurred in one locality, the life-cycle being very similar to that of *O. sulcatus*, except that the adults emerged about two weeks later ; control measures are the same for both species. *Typophorus* (*Paria*) *canellus* var. *quadrinotatus*, Say (strawberry root worm) oviposits in raspberry beds from mid-March to mid-June, and the young larvae feed on the smaller roots. Besides this damage by the larvae, the canes are defoliated in late summer, barking of the canes occurs in late autumn, and the opening buds in the spring are destroyed. Experiments with various insecticides are described ; the treatment recommended is a 70 per cent. sodium fluosilicate dust with diatomaceous earth. Two applications at a ten days' interval should be made in the autumn before hibernation of the beetles, using about 100 lb. to the acre. *Aegeria* (*Synanthedon*) *bibionipennis*, Boisd. (strawberry crown moth) is occasionally a serious pest of raspberries, the eggs being deposited on the lower green leaves and green canes, from mid-June to mid-August. The larvae hatch in about 2 weeks and attack the roots below ground, sometimes killing the cane by girdling the roots. They hibernate in burrows in the roots and pupate in silken cases. *Pennisetia* (*Bembecia*) *marginata*, Harr. (raspberry crown borer), *Tetranychus telarius*, L., and *Cicadella circellata*, Baker, all cause more or less damage to raspberries, and *Pantomorus godmani*, Crotch, is sometimes very destructive in the larval stage. The sawfly, *Hartigia cressoni*, Kby. (raspberry horntail) is occasionally sufficiently numerous to be dangerous ; topping of infested canes in spring and the removal of old infested canes during the winter pruning are recommended against it.

Little (V. A.). **Devil's Shoe-string as an Insecticide.**—*Science*, lxxiii, no. 1890, pp. 315–316, 1 ref. New York, N.Y., 20th March 1931.

Laboratory investigations in Texas with aqueous suspensions of finely ground dried roots of *Tephrosia* (*Cracca*) *virginiana* (devil's shoe-string) as an insecticide showed that though there were marked

variations in toxicity dependent on season, soil, method of drying the material, etc., the best samples were slightly more toxic to *Aphis gossypii*, Glov., than pyrethrum, but less so than derris. They were obtained from sandy soil in the hottest part of the year and dried in the sun; drying in shade, boiling in water or heating the roots caused a loss in toxicity. They kill in a similar manner to derris, by producing paralysis and perhaps also by interfering with respiration. Field experiments with the plant as a contact spray gave good results against *A. gossypii*, *A.* (*Rhophalosiphum*) *pseudobrassicae*, Davis, and larvae of *Malacosoma americana*, F., *Datana ministra*, Dru., and *Leptinotarsa decemlineata*, Say.

PRINCE (A. R.). **Diseases and Insect Pests of the Potato with Methods for their Control.**—*Bull. Nova Scotia Dept. Nat. Resources*, no. 14, 20 pp., 16 figs. [Truro, N.S.] March 1930. [Recd. March 1931.]

A table (pp. 14–17) is given containing popular descriptions of the chief insect pests of potato in Nova Scotia, with very brief notes on their habits and an outline of the methods of controlling each, including formulae for various insecticides.

DAVIAULT (L.). **Les principes de la lutte biologique contre les insectes ennemis de la forêt.**—*Nat. canad.*, lviii, no. 3, pp. 49–58, 19 refs. Quebec, March 1931.

The author discusses forest pests and the factors promoting their increase, and points out that their numbers may be controlled to a considerable extent by better methods of forest management.

LIEBERMANN (J.). **El gorgojo del tomate en Jujuy.** [The Tomato Weevil in Jujuy.]—*Rev. Soc. ent. argent.*, iii, no. 12, pp. 57–62, 1 fig. Buenos Aires, 31st July 1930. [Recd. 1931.]

In the province of Jujuy, North Argentina, tomatos have been found to be attacked by *Phyrdenus muriceus*, Germ. This weevil has also been recorded from other parts of Argentina, and appears to have spread from Bolivia, the country from which it was described. Its biology is being studied with a view to control; notes are given on the bionomics and control of *P. divergens*, Germ., on tomato in Brazil [*R.A.E.*, A, xiii, 198; xvii, 45].

HERROD-HEMPSALL (W.). **The Blind Louse of the Honey-Bee.**—*J. Minist. Agric.*, xxxvii, no. 12, pp. 1176–1184, 4 pls., 2 refs. London, March 1931.

This is a detailed account of investigations on the bionomics of *Braula coeca*, Nitz. [*cf. R.A.E.*, A, xiv, 267], which occasionally infests colonies of honey bees in the southern and midland counties of England. The breeding season of the fly begins in May and continues until late September. The life-cycle from egg to adult lasts 21 days. The adults cannot live on the honey in the cells; unless bees, which they compel to feed them, were present, they died within 6 hours of emergence. The author does not agree with the general opinion that *B. coeca* is unable to live through the winter in England, and that its presence in the hives from year to year is due to its being introduced

with bees imported from warmer climates, since the flies were found on bees in experimental colonies on 25th January 1931. The tunnels made by the larvae in the cappings of the honey cells give the combs an unpleasant appearance, thus rendering them unsaleable. Moreover, the capping is rendered so weak at the sides of the burrows that when the comb is removed from the colony, the honey absorbs atmospheric moisture, becomes thin, and quickly percolates through. Driving tobacco smoke, which kills the fly in 1–2 minutes, through the hive should rid the colony of these pests. The brood chamber should be removed and the floor board brushed in order to remove any flies that might recover.

Petherbridge (F. R.) & Hey (G. L.). **The Control of the Common Green Capsid Bug on Red Currants.**—*J. Minist. Agric.*, xxxvii, no. 12, pp. 1185–1188, 3 refs. London, March 1931.

Until recent years *Plesiocoris rugicollis*, Fall., was the Capsid most commonly found damaging red and black currants in England, but latterly *Lygus pabulinus*, L., has been responsible for serious injury to currants and gooseberries, and to strawberries interplanted with these crops. As it occurs throughout the country, it is now regarded as one of the more important pests of bush fruits [*cf.* *R.A.E.*, A, xvi, 619].

In two experiments described, two proprietary mineral oil emulsions were applied at 7½ per cent. strength and Long Ashton wash at 10 per cent. on 26th February to red currant bushes on which only *L. pabulinus* was present. One of the proprietary mineral oil emulsions gave good commercial control, whereas the other gave only moderate control [*cf.* *R.A.E.*, A, xix, 247]. The Long Ashton wash was of practically no value, and in one of the experiments killed a few of the buds. In other experiments, serious damage was caused to gooseberries and some injury to red currants by spraying with the same washes on 24th January. One of the mineral oil emulsions at 7½ per cent. caused no damage when used alone, but, when it was mixed with 7½ per cent. Long Ashton wash, all the fruit buds on the gooseberry bushes were killed, and the bushes appeared to be damaged, apart from the loss of crop. On red currants, the damage caused by the mixture, although not so severe, was very variable. In some cases there was very little injury, but in others fruit buds and occasionally branches were killed. The Long Ashton wash at 10 per cent. destroyed a number of gooseberry fruit buds and a few red currant fruit buds. At 12½ per cent., the damage was more serious, but was not so severe as that caused by the mixture.

Miles (H. W.). **The Control of the Cabbage Root Fly.**—*J. Minist. Agric.*, xxxvii, no. 12, pp. 1227–1231, 4 pls., 4 refs. London, March 1931.

Phorbia (*Chortophila*) *brassicae*, Bch., is a serious pest of cruciferous crops in England. Cauliflowers appear to be especially susceptible to attack, probably because the time of setting out in early summer coincides with the appearance of the spring swarm of flies, and the drought that often occurs at this time of the year prevents the plants from becoming established quickly and renders them less resistant. The manner in which various crucifers are infested is discussed in detail.

In July 1928, the author observed that, apparently as a result of attacks by the larvae, a yellowish rot occurred around and below the growing points of half-grown swedes, six to ten maggots occurring on a single plant. The putrefaction did not become serious because the season was dry. When the crop was gathered, about 60 per cent. of the plants were affected.

Brief reference is made to various cultural control methods, which include crop rotation and thorough cultivation in autumn and winter. Mercury bichloride dissolved in water (1 oz. to 10 gals.) is of considerable value in control. It should be applied at the rate of ¼ pint to each plant, care being taken to flood the soil at its base. The first application should be made 3–5 days after planting, and the treatment repeated at least twice at intervals of 7–10 days. Demonstrations in 1929 showed that the percentage of cauliflowers attacked in treated plots averaged only 5·6, as against 55·2 in controls. In a similar demonstration on 1,000 plants under market garden conditions in 1930, the percentage attacked was reduced from 47 to 13 by one treatment, at a cost for labour and material of 3*s.* 8*d.* As treatment with mercury bichloride is expensive and difficult to apply under field conditions, preliminary experiments have been carried out with naphthalene [*cf.* *R.A.E.*, A, xix, 74] at the rate of 15 lb., and with creosote absorbed in precipitated chalk, at the rate of 2 lb., to 1,000 plants at each application. Both have given indications of being of value as repellents when applications are made a day or two after setting out the plants and repeated twice at weekly intervals.

MARTIN (H.). **The Examination of Tar and Mineral Oil Insecticides.**—*J. Soc. Chem. Indust.*, l, no. 11, pp. 91T–94T, 10 refs. London, 13th March 1931.

As the composition of the proprietary tar distillate washes and mineral oil preparations now on the English market is seldom stated, simple methods for obtaining data on them have been evolved. The following is the author's summary: Methods are described for the separation of the oil and determination of the oil content of mineral oil insecticides. The determination of the suitability of the oil for spray purposes is discussed, and methods are given for the determination of constants deemed to be of value for this purpose. Methods are given for the analysis of the various types of tar oil preparations now in use as winter washes.

MOREAU (L.) & VINET (E.). **Essais de destruction de l'eudémis au moyen des rayons ultra-violets.**—*C.R. Acad. Agric.*, xvii, no. 9, pp. 292–297. Paris, 1931.

The authors describe experiments in a vineyard in France, which indicate that a light trap with ultra-violet rays [*cf.* *R.A.E.*, A, xvii, 332, 571] is of little or no value against *Polychrosis botrana*, Schiff.

[VUKASOVIĆ] VOUKASSOVITCH (H. & P.). **Les ennemis naturels de la cochenille** *Lecanium corni* **L.**—*C.R. Soc. Biol.*, cvi, no. 8, pp. 688–691. Paris, 6th March 1931.

The outbreak of the Coccid, *Lecanium corni*, Bch., in the plum orchards of Jugoslavia [*cf.* *R.A.E.*, A, xvii, 209; xviii, 605, etc.], and

the spread of the allied species, *L. rufulum*, Ckll. (*pulchrum*, King) on oaks, and *L. coryli*, L., on *Robinia*, have led to a study of their insect enemies. The Coccinellid, *Exochomus quadripustulatus*, L., is present in most localities as a predator on *L. corni*. It hibernates under the bark of trees or in dry leaves, in the adult stage or, rarely, as a larva. Oviposition begins with the fine weather, larval development generally being complete in June, when the pupal period occupies 9 or 10 days, pupation occurring on the branches or leaves among the Coccids. The adults feed on the larvae of the Coccid during the summer, and with the approach of autumn enter hibernation. This Coccinellid was difficult to rear artificially, owing to its cannibal habits.

The Eulophid, *Coccophagus scutellaris*, Dalm., was reared from larvae of *L. corni*. The parasite larva hibernates within the host, and passes about 10 days in the pupal stage. All the adults were obtained within a period of about 2 weeks during May ; they lived only a few days in captivity. This parasite has also been obtained from *L. coryli* on *Robinia*. As this Coccid has two generations in a year, there are several generations of the parasite on it, and adults were obtained in the laboratory up to mid-November. These chiefly emerged from second-stage larvae, and also sometimes from adults, two parasites occasionally emerging from one scale. The Encyrtid, *Eucomys swederi*, Dalm. [*cf.* xvii, 210] was obtained on one occasion only from *L. corni* in the second half of May. Two parasites generally emerged from one Coccid ; they lived for an average of 18 days. A few were also obtained from *L. coryli* on *Robinia*. Two other Encyrtids, *Cerapterocerus mirabilis*, Westw., a rare parasite, and *Blastothrix sericea*, Dalm., were obtained from mature scales, at the period of hatching of the eggs, in mid-June.

Of these insects, only the Coccinellid and the Eulophid can be considered of any importance, and even these are so limited in numbers that the diminution observed in the intensity of infestation by *L. corni* can hardly be attributed to their activities.

[Vukasović] Voukassovitch (H. & P.). **Sur la mortalité de la cochenille,** *Lecanium corni* **L.**—*C.R. Soc. Biol.*, cvi, no. 8, pp. 691–694. Paris, 6th March 1931.

An attempt has been made to determine the cause of the high degree of mortality of *Lecanium corni*, Bch., that occurs at all periods of the year in Jugoslavia. During the winter, cold and humidity would naturally be expected to cause the death of many of the Coccids, but after the winter of 1927–28, which was very severe, although dry, infestation was heavier and the rate of spread more rapid than in previous years. The resistance to both humidity and sudden changes of temperature is very great. There is, however, a high degree of mortality even during fine summer weather. At present it seems that the reason for this must be found in some internal cause inherent in the insect. The great reproductive capacity of the females (one of which may deposit as many as 2,000 eggs) is in itself an indication of high potential mortality, but the actual destructive factor remains unknown.

[Vukasović] Voukassovitch (H. & P.). **Sur la ponte des Hyménoptères parasites entomophages.**—*C.R. Soc. Biol.*, cvi, no. 8, pp. 695–697. Paris, 6th March 1931.

In a study, undertaken in Jugoslavia, of the method of parasitism of the Pteromalid, *Habrocytus saxeseni*, Ratz., pear buds containing larvae of *Anthonomus cinctus*, Redt., were offered to the females, and also larvae of *Calandra granaria*, L., the Ichneumonid, *Orthopelma luteolator*, Grav., *Tinea granella*, L., *T. pellionella*, L., and *Macrosiphum* (*Siphonophora*) *rosae*, L., in buds that had been attacked by *Anthonomus*. In each case the parasite first paralysed the host, then deposited an egg and constructed a feeding-tube, which was not in every case completed. The parasite is therefore obviously attracted by the protective cover of the host rather than by the host itself; it did not attack even its favourite host when offered without this covering. Females of the Ichneumonid, *Nemeritis canescens*, Grav., readily pierced with their ovipositors cocoons of *Ephestia kühniella*, Zell., whether containing larvae or empty, but did not attack exposed larvae. *Elasmus flabellatus*, Boy., also paralyses its host before ovipositing and constructs a feeding tube. This parasite has been obtained from cocoons containing larvae or pupae of the Braconids, *Microgaster globatus*, L., *Hormius moniliatus*, Nees, and *Macrocentrus abdominalis*, F., the Ichneumonids, *Eulimneria* (*Limnerium*) sp. and *Angitia armillata*, Grav., and *Eurytoma appendigaster*, Swed., etc. It attacks the host when the latter has partly constructed its cocoon, but ignores exposed larvae. It was unable to paralyse the larvae of the Cynipid, *Rhodites rosae*, L.; eggs were deposited and the larvae emerged but were unable to develop.

[Vukasović] Voukassovitch (H. & P.). **Sur la lutte pour la possession de l'hôte chez les larves d'ectoparasites solitaires.**—*C.R. Soc. Biol.*, cvi, no. 8, pp. 697–700, 3 refs. Paris, 6th March 1931.

Reference is made to observations of various workers that certain Chalcidoids that are external parasites in the larval stage frequently deposit several eggs on one host, but that the larvae, immediately after hatching, wander about on the host, devouring each other and any eggs that they encounter, so that only one matures. This has recently been found by the author to occur also in the case of an Ichneumonid, *Pimpla pomorum*, Ratz., parasitic on *Anthonomus cinctus*, Redt., and *A. pomorum*, L.; a detailed account of his observations, which were made in Serbia, is given.

Timon-David (J.). **Contribution à l'étude de la spécificité biochimique des parasites. Huile d'***Exeristes roborator* **Fab.**—*C.R. Soc. Biol.*, cvi, no. 10, pp. 829–831, 3 refs. Paris, 20th March 1931.

Analyses of the oils contained in the fat-body of mature larvae of *Pimpla* (*Exeristes*) *roborator*, F., and *Pyrausta nubilalis*, Hb. [*cf.* *R.A.E.*, A, xvii, 193], showed that they were practically identical. It is therefore concluded that the fat content of the host is assimilated by the parasite without undergoing any appreciable transformation.

Pfeffer (A.). **Nový nebezpečný škůdce smrku zavíječ modřínový** *Enarmonia* (*Epinotia, Steganoptycha*) *diniana* **Z.** (*pinicolana* **Z.**). [A new dangerous Pest of Spruce, the Larch Tortrix.]—*Ochrana Rostlin*, x, no. 4–5, pp. 81–95, 8 figs. Prague, 1930. (With a Summary in German.)

Enarmonia diniana, Gn., all stages of which are briefly described, caused serious injury to spruce forests in Czechoslovakia in 1930, infestation beginning in a locality at an altitude of about 3,000 ft., and eventually covering an area of over 37,000 acres. Young larch [*Larix*] and sometimes *Pinus uliginosa* were also attacked. The eggs, which were found in small batches under the scales of the buds of the previous year's shoots, hatch at the end of May, the feeding period lasting till the end of June. The mature larvae drop to the ground by silken threads and pupate in the upper layer of humus, though a number of pupae were also found in cracks in the bark, or, in the case of young trees, at the base of the shoots. The pupal stage lasts 14–30 days. The adults are negatively phototropic. At the beginning of the outbreak, only trees 80–120 years old were infested, but later those of all ages were attacked, including seedlings. The character of the damage caused to spruce of different ages is briefly discussed, and the manner in which the larvae feed is described ; severe injury is caused by the more mature individuals, which join several twigs together with a silken web and devour all the needles.

The larvae and pupae are destroyed by the Carabids, *Calosoma sycophanta*, L., *Carabus nemoralis*, Müll., and *Pterostichus nigritus*, F., the Coccinellid, *Anatis ocellata*, L., Syrphid larvae, and various birds. Parasites reared from the pupae were the Tachinids, *Nemorilla maculosa*, Mg., and *Lydella nigripes*, Fall., and the Ichneumonids, *Phaeogenes lascivus*, Wsm., *P. ischiomelinus*, Grav., *Microcryptus micropterus*, Grav., *Hemiteles fulvipes*, Grav. (a hyperparasite), *Pimpla examinator*, F., *Lissonota transversa*, Bridgm., *Nemeritis caudatula*, Thoms., *Triclistus pallidipes*, Hlmgr., *Bassus laetatorius*, F., and *Lampronota melancholica*, Grav. Of these, *Pimpla examinator* and *Phaeogenes lascivus* were the most common. Dusting with calcium arsenate at the rate of about 35 lb. to the acre proved of value against the larvae of the third instar, as at this stage they often abandon their web nests and feed unprotected, although a 100 per cent. mortality was not obtained.

Robek (A.). **Kůrovci, škůdci ovocných stromů.** [Bark-beetles injurious to Fruit Trees.]—*Ochrana Rostlin*, x, no. 4–5, pp. 95–98. Prague, 1930.

Unusually severe damage was caused to fruit trees in Czechoslovakia by the exceedingly cold winter of 1929–30, and in the following spring the weakened trees were attacked by various bark-beetles, of which *Scolytus* (*Eccoptogaster*) *mali*, Bech. (*pruni*, Ratz.), and *S.* (*E.*) *rugulosus*, Ratz., were the most important, being responsible for the death of many trees and a considerable loss in the yield of fruit. Brief descriptions are given of the adults and of the galleries. *S. mali*, which infests plums, peaches, apricots, cherries and, to a less extent, apples and pears, has two generations a year, hibernation taking place in the larval stage. The adults of the first generation are on the wing in May and June, and those of the second, the life-cycle of which is

completed in 11–12 weeks, in August and September. *S. rugulosus* chiefly attacks apple and pear, and also occurs on other trees together with *S. mali*.

The usual control measures are recommended, including clean cultivation of the orchards, the use of trap logs, protection of birds, the application of 8–12 per cent. carbolineum washes, and coating the trunks and branches in the spring with lime-sulphur.

BAUDYŠ (E.). **Fytopathologické poznámky** [Phytopathological Notes] **vi.**—*Ochrana Rostlin*, x, no. 4–5, pp. 98–119, 10 figs. Prague, 1930. (With a Summary in German.)

Of the insect pests observed in Czechoslovakia in 1930, *Zabrus tenebrioides*, Goeze, was the most important, the larvae causing considerable damage to winter wheat, especially on the edges of the fields and in districts where crop rotation is not practised. Dusting the infested fields with nitrogenous lime or kainit proved effective. In one locality, the migration of the larvae was successfully stopped by barriers of kainit about 3–4½ ft. wide and ½ in. deep. The isolation of uninfested fields by trenches, with quicklime or a mixture of nitrogenous lime and kainit at the bottom, is recommended. The larvae were also controlled by sprays of a proprietary form of lead arsenate or 1½ lb. Urania Green and 100 gals. Bordeaux mixture.

Chlorops taeniopus, Mg., the larvae of which hibernated in rye and *Agropyrum repens*, was abundant in the spring on wheat in many districts. *Euxoa* (*Agrotis*) *segetum*, Schiff., caused considerable damage to beet, and *Polia* (*Mamestra*) *oleracea*, L., and *Scotogramma* (*M.*) *trifolii*, Rott., infested the leaves of onion, poppy and beet in shady places. For their control, it is recommended to strew ashes on the infested plants, or to let turkeys feed in the plantations. Roses were attacked by the larvae and adults of *Typhlocyba rosae*, L., which caused the leaves to drop and the flowers to shrivel, and against which a spray of nicotine and soap is recommended. The overwintering eggs are deposited in cracks of the bark of young branches and might be destroyed by 5–6 per cent. carbolineum.

BLATTNÝ (—). **Nový škůdce malin** (*Rubus idaeus*). [A new Pest of Raspberry.]—*Ochrana Rostlin*, x, no. 4–5, p. 144. Prague, 1930.

In the summer of 1929, raspberries were severely attacked in one locality by *Tetrodontophora gigas*, Reut., which destroyed about 33 per cent. of the fruit. The distribution of this Thysanuran in Czechoslovakia is briefly reviewed; it usually occurs in the mountainous districts, being found in numbers under moss and leaves, and between stones. Should it become a pest of cultivated raspberries in the valleys, the removal of infested leaves might be effective, as it first attacks the leaves and then migrates to the fruit.

VIELWERTH (V.). **Vliv porostu půdy na výskyt ponrav.** [The Effect of Vegetation on the Occurrence of Grubs in the Soil.]—*Ochrana Rostlin*, x, no. 6, pp. 153–159. Prague, 1930. (With a Summary in German.)

An account is given of experiments in Czechoslovakia to determine the relation between the intensity of infestation by cockchafer larvae and the kind of vegetation present in the field at the time of the

oviposition of the females. For this purpose, various crops and fruit trees were planted in experimental plots in 1929, which was a flight year for cockchafers (chiefly *Melolontha melolontha*, L.), and in the following year the same plots were used for crops and trees different from those cultivated in 1929, the presence and abundance of the larvae in the soil being estimated by the damage caused to the plants.

It was found that while some of the plots were heavily infested, others were practically free from the larvae, and that by cultivating certain crops in a flight year, infestation may be prevented. Oviposition readily occurs in soil on which clover, oats or wheat is grown, or in fallow land covered with weeds, whereas no eggs are laid in fields in which tobacco or root-crops are cultivated, or in fallow land in which the growth of grass and weeds is prevented by constant ploughing. It is also recommended that the orchards be kept free from weeds, and that the fields be ploughed in the autumn after harvest in order to expose the larvae.

Šip (V.). **Přípěsvek k biologii housenky zavíječe kukuřičného** (*Pyrausta nubilalis* **Hb.**). [Contribution to the Biology of the Larvae of the Maize Moth (*P. nubilalis*).]—*Ochrana Rostlin*, x, no. 6, pp. 159-163. Prague, 1930.

Pyrausta nubilalis, Hb., brief notes on the bionomics of which are given, is an important pest of maize in Czechoslovakia, and investigations were carried out in the beginning of October 1930 to determine in what part of the stalk most of the larvae occur when the plants are cut. Examination of the stubble and stalks of three different varieties of maize taken from the edges and centres of heavily infested fields showed that 54–78 per cent. of the larvae were in the four lower internodes of the stalk, and of these 55–73 per cent. occurred in the third from the bottom. In Czechoslovakia the plants are usually cut just above the second internode, and though the stubble is burnt or deeply ploughed in to kill the larvae, the stalks, containing most of those in the third internode, are stacked in the open. For successful control it would be essential to destroy the stalks as well. It was also found that many stalks remain uninjured in the upper part, the lower internodes alone being damaged, which indicates that the larvae migrate from plant to plant in search of food ; they avoid feeding on the nodes, only 0·2 per cent. of these being injured. The number of infested cobs was negligible.

Prell (H.). **Die nadelknickende Kieferngallmücke** (*Cecidomyia baeri* n. **sp.**), **ein verbreiteter neuer Kiefernschädling.** [The Needle-bending Pine Gall-midge, *C. baeri*, sp. n., a widely distributed new Pest of Pines.]—*Tharandter forstl. Jahrb.*, lxxxii, no. 1, pp. 36–52, 5 figs., 10 refs. Berlin, 1931.

A gall-midge, *Cecidomyia baeri*, sp. n., the generic position of which is doubtful, is described from pine in Saxony and is compared with *Thecodiplosis brachyntera*, Schwaegr., which also occurs there. Whereas the latter appears in May and attacks quite young needles, checking their development and causing a reduction in their length, *C. baeri* appears in June when development is complete, and the injury usually results in the needles bending at the base, many hanging obliquely downwards. Many of the injured needles turn yellow in August

and begin to fall by about September. The larva is usually found in the cleft between the two needles of a pair. *C. baeri* appears to be as widespread as *T. brachyntera*, with which it has been confused.

LEUTHOLD (—). **Fichtenkulturwald und Massenvermehrungen der Nonne.** [Planted Spruce Forests and Outbreaks of the Nun Moth.]—*Tharandter forstl. Jahrb.*, lxxxii, no. 1, pp. 53–81, 5 figs., 19 refs. Berlin, 1931.

The various factors that may be considered responsible for outbreaks of the nun moth [*Lymantria monacha*, L.] on spruce are discussed, chiefly with reference to Germany. Climate, particularly the temperature during the vegetative period, appears to be the primary factor affecting its distribution. An altitude of about 2,300 ft. and 58° N. lat. represent the approximate limits of moderate infestation. An outbreak develops when the following conditions occur, either singly or together : abnormally warm weather in July and August, followed, in the second or third year, by equally warm weather in May ; the disappearance of the natural enemies that maintain a biological balance ; and the improvement in conditions favourable to life and increase, such as the establishment of extensive pure forests of spruce of uniform age. Natural pure forests of spruce only occur outside the area of distribution of the moth.

ARNDT (W.). **Zur Frage der Verdaubarkeit der Badeschwammgerüstsubstanz.** [The Question of the Digestibility of the Bath-sponge Skeleton.]—*Zool. Anz.*, xciii, no. 7–10, pp. 199–207, 7 figs., 7 refs. Leipzig, 1st March 1931.

From an examination of their excreta, the author concludes that larvae of *Dermestes frischi*, Kug., can probably digest sponges, but that those of *Attagenus* sp. are unable to do so.

CRÜGER (O.) & KÖRTING (A.). **Ueber die Eiablage der Getreideblumenfliege und die unmittelbare Voraussage ihres Schad-Auftretens.** [On the Oviposition of *Hylemyia coarctata* and the immediate Forecast of an Outbreak.]—*Z. PflKrankh.*, xli, no. 2, pp. 49–61, 1 fig., 6 refs. Stuttgart, 1931.

The method of predicting damage by *Hylemyia coarctata*, Fall., by determining the number and condition of the eggs in the field [*R.A.E.*, A, xvi, 298 ; xvii, 634] was tested on a large scale in East Prussia in the autumn of 1929 and spring of 1930, and the results are recorded in a series of tables. Contrary to the findings of Bremer in Schleswig-Holstein, it appears that in East Prussia swedes are not a dangerous crop to precede the one liable to attack, whereas winter rye is dangerous. It is not the actual crop that is of importance, but the condition of the field at the date of oviposition, the largest number of eggs being found in dry soil, and the smallest in wet.

Pflanzenschutz und Bienenzucht. Vortragsreihe des Reichsausschusses für Bienenzucht. [Plant Protection and Apiculture.]—Demy 8vo, 32 pp. Anklam, Richard Poettcke Nachf., 1931.

In view of the discussions in Germany regarding the effect of insecticides, more especially arsenical dusts, on bees, the Imperial Committee

for Apiculture arranged for a series of lectures on the subject at its meeting in May 1930. These are here reproduced, the authors and titles (translated) being: K. H. Kickhöffel, Plant Protection and Apiculture; [H.] Morstatt, The Necessity for Poisons in Plant Protection Work; [A.] Borchert, The Effect of poisonous Insecticides on Bees; [—] Hilgendorff, The Determination of Arsenic in Bees; [W.] Trappmann, The Use of Poisons for combating Pests of Orchards, Vines and Field Crops; [M.] Voelkel, The Use of Poisons against Forest Pests; [H.] Götze, The Dangers to Apiculture of the Use of poisonous Insecticides.

SCHWARZ (L.) & DECKERT (W.). **Ueber das Penetrationsvermögen der Blausäure bei praktischen Durchgasungen.** [On the penetrative capacity of Hydrocyanic Acid Gas in practical Fumigation Work.]—*Z. Desinfekt.*, xxii, no. 12, pp. 750–758, 3 refs. Berlin, December 1930.

A simple means for ascertaining the quantity of hydrocyanic acid gas that has penetrated to any given point in the material fumigated is provided by the use of soda-lime kieselgel tablets placed in small perforated porcelain containers. If these are placed in flour, they must be themselves enclosed in fine silk gauze. Tablets in containers hung in the air in various parts of the room enable the average concentration of the gas to be determined. Simultaneous exposure of test insects indicates the strength required to kill them. A tablet that has absorbed the gas is dissolved in water to make 100 cc. and the liquid is filtered and titrated with potassium iodide and silver nitrate. This enables an absorption of even 0·05 mgm. of hydrocyanic acid to be found.

The following conclusions are drawn from a series of experiments described. The gas has very great penetrative power, and it is unimportant whether the material be coarse like rice or fine like potato flour. Penetration deep into the mass of a highly absorbent material is slower than in a less absorbent one, and the gas is subsequently given up more slowly by the former material. There thus results an after-effect that may kill pests still alive when ventilation begins after fumigation. The gas-resisting properties of paper and flour paste render them suitable materials for sealing a room for fumigation. Wood is penetrated by the gas and a tablet-absorbtion of 2 mgm. indicates a concentration sufficient to kill *Hylotrupes bajulus*, L. The tablet method also enables the amount of gas that has leaked from the fumigation chamber into adjoining rooms to be determined; an absorption of over 1 mgm. indicates that the walls are dangerously permeable.

ZACHER (F.). **Interessante Fälle aus der Praxis des Vorratsschutzes.** [Interesting Cases in Work against Pests of Stored Products.]—*Mitt. Ges. Vorratsschutz*, vii, no. 1, pp. 5–8. Berlin, January 1931.

Various instances of unusual infestations by pests of stored products recorded from Germany include *Dermestes lardarius*, L., found in two localities attacking macaroni; the fig moth, *Ephestia figulilella*, Grgs., in cashew-nuts (*Anacardium occidentale*) imported from China;

Silvanus (*Oryzaephilus*) *mercator*, Fauv., in litchee fruits [*Nephelium litchi*] from Canton and in cotton seed from Cairo; and *Tribolium madens*, Charp., in seeds of violets, *Centaurea*, and other flowers.

Kunike (G.). **Zur Lebensgeschichte des Reismehlkäfers,** *Tribolium confusum.* [The Life-history of the Confused Flour Beetle, *T. confusum.*]—*Mitt. Ges. Vorratsschutz*, vii, no. 1, pp. 8–11. Berlin, January 1931.

Notes on the bionomics of *Tribolium confusum*, Duv., are given from the literature. Hydrocyanic acid gas produced by Zyklon B is effective against it if used at a concentration of 1–2 volumes per cent. for twenty-four hours, and the flour is not affected as it sometimes is by chloropicrin.

Kaiser (M.) & Fried (E.). **Die Durchgasung des Kefermarkter Flügelaltares mit Blausäure (Zyklon B).** [The Fumigation of the Altar at Kefermark with Zyklon B.]—*Z. Desinfekt.*, xxiii, no. 1, pp. 1–12. Berlin, January 1931.

A detailed account is given of the successful fumigation against *Anobium* [*punctatum*, DeG. (*striatum*, Ol.)] of the altar of a church in Upper Austria with hydrocyanic acid gas generated from Zyklon B [*R.A.E.*, A, xix, 183]. The whole building of about 212,000 cu. ft. was treated with about 166 lb. of this material. As it has been found that hydrocyanic acid gas as used in flour mills is ineffective against this Anobiid [ix, 255], it is suggested that the irritant component in Zyklon B causes the adult beetles to open their elytra, under which they carry a supply of air, and thus renders poisoning possible. It is possible that the larvae may be specially susceptible to the irritant gas.

Kemper (H.). **Ueber Massenvorkommen von Heimchen auf Müllabladeplätzen.** [On the Mass Occurrence of Crickets in Refuse Dumps.]—*Z. Desinfekt.*, xxiii, no. 1, pp. 11–14. Berlin, January 1931.

Referring to a report of an outbreak of *Gryllus domesticus*, L., in a refuse dump in Switzerland [*R.A.E.*, A, xviii, 525], several similar cases are recorded from Germany. Dumps provide optimum conditions for crickets brought from dwelling houses in household refuse.

Goidanich (A.). **Gli insetti dannosi alla canapa.** [Insects injurious to Hemp].—*Ann. Tec. Agrar.*, i, fasc. 4, pp. 423–431. Rome, 1st April 1929. [Recd. 1931.]

This is a briefer account than one already noticed [*R.A.E.*, A, xvii, 330] of the insect pests of hemp [*Cannabis sativa*] in the province of Bologna. Next in importance to *Pyrausta nubilalis*, Hb., are *Psylliodes attenuata*, Koch, which destroys the young seedlings, and *Calocoris norvegicus*, Gmel., *Phorodon cannabis*, Pass., *Ceuthorrhynchus rapae*, Gyll., and *Barathra* (*Mamestra*) *brassicae*, L., which attack the flowers and seeds. The lesions produced by the feeding of various Rhynchota affect the quality of the fibre. Other species that may sometimes be injurious include *Gryllus chinensis*, Weber, *G. desertus*, Pall., and *Phytometra* (*Plusia*) *gamma*, L.

Zirnits (J.). **Aphids found on different Species of *Ribes* in Latvia** [*In Lettish and English*].—*Acta Inst. Def. Plant. latviens.*, i, pp. 5–14. Riga, 1930.

Of the Aphids attacking *Ribes* spp. in Latvia, *Amphorophora rhinanthi*, Schout., is recorded for the first time on a plant of this genus. Observations in 1929 show that *Alectorolophus minor* and *A. major*, on which it has long been known to occur, are only its secondary food-plants, the primary one being red currant. The stem mothers and their offspring feed only on the lower surface of the leaves and cause considerable distortion of the latter, without, however, affecting the leaf-stalks and the young shoots. The alate migrants begin to appear in the second generation, but apterous individuals may be found even in the third generation up to July, especially when young and vigorously growing plants are infested. Probably about four generations, including both alate and apterous females, develop on *Alectorolophus* from mid-June until the beginning of August. At the end of this period winged sexuparae and males, which migrate back to red currant, begin to appear; the former give rise to sexual females, which deposit the winter eggs on the tips of the twigs, at the buds and in rough bark.

Amphorophora cosmopolitana, Mason (*lactucae*, Kalt.) is the most common species occurring in nurseries on red currant, gooseberries and *Ribes alpinum*, its secondary food-plants being lettuce and *Sonchus* sp. Although described from Holland on black currant, *Rhopalosiphoninus ribesina*, v.d.G., a non-migrating species, was observed in Latvia on red currant only; attempts to transfer it to black currant failed. It prefers shade and humidity and occurs on the older central branches overhanging the soil. The wet and cool summer of 1928 was very favourable to it, and stem mothers were very numerous in the following spring. Its numbers, however, were greatly reduced by the subsequent warm and dry weather. The stem mothers, sexuparae and sexuales are wingless, but the summer forms may be alate or apterous. Infested plants are weakened, and the leaves are dwarfed and begin to fall as early as the end of June. Other species discussed include *Capitophorus ribis*, L., on *R. alpinum* and, rarely, red currant, its secondary food-plant being *Galeopsis*; *C. galeopsidis*, Kalt., which the author treats as distinct from *C. ribis*, on black and red currant and *R. alpinum* with *Galeopsis*, *Lamium* and *Stachys* as secondary food-plants; *Myzus lactucae*, Schr. (*Nasonovia ribicola*, Kalt.), on red currant, *R. alpinum* and gooseberries, its secondary food-plants being chicory (*Chicorium intybus*) and *Crepis* sp.; *Aphis grossulariae*, Kalt., a non-migrating species, on black and red currant, gooseberries and *R. alpinum*; and *Eriosoma ulmi*, L., the primary food-plant of which is elm, on red and black currant.

Ozols (E.). **The Importance of Calcium Arsenate in checking *Phaedon cochleariae* F.** [*In Lettish.*]—*Acta Inst. Def. Plant. latviens.*, i, pp. 18–22. Riga, 1930. (With a Summary in English.)

In 1929, *Phaedon cochleariae*, F., reduced the yield of turnips in Latvia, although only present in insignificant numbers. In field tests, the yield of the crop was increased by 26·5 per cent. by three applications of a dust of calcium arsenate and lime, 1 : 3, the results obtained justifying the cost of materials. In a laboratory experiment the

beetles were fed on leaves dusted with 5 mgm. of the mixture per sq. cm. On the fifth day 90·3 per cent. of the females and 59·4 per cent. of the males were dead, the former having consumed 2·5 times as much food as the latter.

Ozols (E.). **The principal Pests of cultivated Plants for the Year 1929.** [*In Lettish.*]—*Acta Inst. Def. Plant. latviens.*, i, pp. 26–30, 3 figs., 1 ref. Riga, 1930. (With a Summary in English.)

Mayetiola destructor, Say, was the principal pest of cereals in Latvia in 1929, the average percentage of infested winter rye being 8·9 and that of winter wheat 6·9, with a resulting loss of over 21,100 tons of the total of these crops. A list of other pests of cereals is given, which, however, were only of secondary importance. Pests of vegetables included *Trioza viridula*, Zett., which was the most important, and *Psila rosae*, F., on carrots, and *Pegomyia hyoscyami*, Pz. (*conformis*, Fall.) on beet.

Zirnits (J.). **New Food-plants of Aphididae** [*In Lettish and English*]. —*Acta. Inst. Def. Plant. latviens.*, i, pp. 47–52, 6 refs. Riga, 1930.

Among the Aphids recorded on various food-plants in Latvia, one found on the roots of *Populus tremula* was tentatively identified by A. K. Mordvilko as a migrant form of *Pachypappella* (*Pachypappa*) *lactea*, Tullgr. Attempts to transfer winged migrant forms of the latter from the leaves to the roots of *P. tremula* were, however, unsuccessful. The Aphids were found in small colonies of 10–50 individuals, all the year round, on roots of not more than 4 mm. in diameter, at a depth of 1 mm. below the soil surface. The roots were swollen to twice their natural size, and many were withered. Attempts to rear winged individuals in the insectary were unsuccessful, nor were any found in the open.

[Spessivtsev (P. N.).] **Спесивцев (П. Н.). A Key to the Bark-beetles of European SSR (Excluding the Crimea and the Caucasus).** [*In Russian.*]—Demy 8vo, 103 pp., 162 figs. Moscow, Gos. Sel'skokhoz. Izd., 3rd edn., 1931. Price 75 *kop.*

Keys are given to the sub-families, genera and species of Scolytids occurring in European Russia, excluding the Crimea and the Caucasus, followed by a list of those occurring in the Russian Union, with indications of their distribution throughout the world and the species of trees attacked.

[Beĭ-Bienko (G. Ya.).] **Бей-Биенко (Г. Я.). The zonal and ecological Distribution of Acrididae in the West Siberian and Zaisan Plains.** [*In Russian.*]—*Bull. Plant Prot.*, Ent., i, no. 1, pp. 51–90, 29 refs. Leningrad, 1930. (With a Summary in English.) [Recd. April 1931.]

A more or less extensive zonal variability with regard to ecological distribution can be observed in most species of grasshoppers occurring in Western Siberia. In the more northern zones, an individual species populates a drier habitat, whereas in the southern ones, it occurs in

more humid habitats, with a richer vegetation. This is due to the zonal variation in the microclimate of the habitat, since a given plant association in a more northern zone is characterised generally by a lower temperature and higher humidity than the same association further south.

The distribution of any species of grasshopper can only be continuous within the optimum zone, where favourable habitats occupy large continuous areas. In the more northern or southern zones, habitats of this kind would occur only in patches, and the grasshoppers would have an interrupted distribution. It is only in its optimum zone that a species can become a serious pest. However, when the natural conditions are disturbed by activities of man, such as grazing of cattle, deforestation, or agriculture, secondary habitats are often produced that may be exceedingly favourable for certain grasshoppers.

[Predtechenskiĭ (S. A.).] **Предтеченский (С. А.). Die Heuschrecke** (*Locusta migratoria* **L.**) **in der Rjasano-Tambowschen Niederung.** [The Breeding-places of the Asiatic Locust (*Locusta migratoria* L.) in the low Plain of the Ryazan and Tambov Governments. (*In Russian.*)]—*Bull. Plant. Prot.*, Ent., i, no. 1, pp. 3–49, 12 refs. Leningrad, 1930. (With a Summary in German.) [Recd. April 1931.]

Locusta migratoria, L., is one of the few species of southern Acridids that penetrate north as far as the forest zone. There it occurs in dry and warm habitats with sandy soils, usually in cultivated or fallow land. A detailed description of the ecology of the breeding grounds is given. Soon after becoming adult, the locusts, even if they are not swarming, undertake flights, after which they often alight on habitats unsuitable for breeding. The flights, therefore, must constitute an important factor in regulating the numbers of the locust. Optimum conditions for breeding occur during dry years, and yearly fluctuations in the weather must be considered as the primary cause of the periodicity of locust outbreaks in the Central Russian breeding areas.

[Predtechenskiĭ (S. A.).] **Предтеченский (С. А.). Praktische Resultaten der ökologischen Studien über die Wanderheuschrecke in Mittelrussland.** [Practical Results of the ecological Studies of the Migratory Locust in Central Russia. (*In Russian.*)]—*Bull. Plant Prot.*, Ent., i, no. 1, pp. 149–159, 3 refs. Leningrad, 1930. (With a Summary in German.) [Recd. April 1931.]

Investigations of the periodicity of outbreaks of *Locusta migratoria*, L., in Central Russia have shown that it is regulated by weather conditions [see preceding paper]. It is possible, therefore, on the basis of meteorological data for two or three years, to determine whether an outbreak is probable within the next year or two. Years with a cold spring and a mean summer temperature below, or equal to, the normal are unfavourable for the development of the locust. If the mean temperature for the spring and summer months exceeds the average by 1·5–2·5° C. [2·7–4·5° F.], and the rainfall is below the average, the year is favourable, and after two such years in succession a mass outbreak should be expected and precautions taken, such as the establishment of leguminous crops on fields that would otherwise be left fallow, and the sowing of green fodder crops immediately

after harvesting the early summer cereals. Fields with light dry soils unsuitable for crops should not be left bare, but should be planted with trees.

[Olsuf'ev (N. G.).] **Олсуфьев (Н. Г.). Zur Frage über die Periodizität der asiatischen Heuschrecke.** [On the Question of the Periodicity of the Asiatic Locust. (*In Russian.*)]—*Bull. Plant Prot.*, Ent., i, no. 1, pp. 91–147, 6 graphs, 83 refs. Leningrad, 1930. (With a Summary in German.) [Recd. April 1931.]

Though the periodic outbreaks of *Locusta migratoria*, L., in Central Russia are regulated by weather conditions [see preceding paper], the latter are always favourable to it in the more southern breeding areas, and there the outbreaks are regulated by spring floods. The level of the floods varies greatly from year to year, but when it is high many egg-deposits are flooded and the numbers of locusts reduced. The eggs are only destroyed, however, if the flooding occurs at the later stages of embryonic development, when submergence lasting 10–15 days is fatal; the flooding of undeveloped eggs is not injurious. Thus, the regulation of the numbers of the locusts depends not only on the height of spring floods, but also on their dates with relation to those of embryonic development.

Another regulating factor is the tendency of locust swarms to migrate from their breeding grounds. The migration depends on a high air temperature, and its direction is irregular, usually coinciding with the prevailing wind. The migrating swarms often have to deposit their eggs under wholly unsuitable conditions, under which the progeny has no chance to survive.

Natural enemies of the locust do not play any considerable part in the regulation of its numbers in the areas studied.

Uvarov's theory of phases is criticised as being inadequate to explain the periodicity of locust outbreaks. The transformation of locusts under the influence of crowding or isolation is regarded as a result of the increase or decrease in numbers, but not as a factor constituting the actual cause of periodicity.

The influence on locusts of human activity is discussed. The drainage of the reed-beds of the Kuban river resulted in protecting the locusts from floods and in a series of outbreaks. Any partial drainage schemes cannot be, therefore, of immediate value in the destruction of breeding grounds, and artificial control measures should be pursued systematically and on a large scale.

[Frantzi (A. M.) & Dyukov (N. N.).] **Франци (А. М.) и Дюков (Н. Н.). The Fall Generation of** *Locusta migratoria* **L. in Daghestan in 1927.** [*In Russian.*]—*Bull. Plant Prot.*, Ent., i, no. 1, pp. 179–189, 1 graph, 11 refs. Leningrad, 1930. (With a Summary in English.) [Recd. April 1931.]

An abnormal hatching of hoppers of *Locusta migratoria*, L., ph. *gregaria* occurred in September 1927 in the sand dunes of the Kara-Nogai steppe, Daghestan, from eggs laid in early August.

It is suggested that the usual diapause is a direct response to meteorological factors, and that the appearance of hoppers in autumn was due to exceptionally favourable temperature and humidity conditions in that year during the embryonic development, as well as to the greater warmth of the sandy soil in which all the eggs were laid.

[Rukavishnikov (B. I.).] **Рукавишников (Б. И.). Contributions to the Study of the Flies parasitic on the larval and adult Instars of the Migratory Locust.** [*In Russian.*]—*Bull. Plant Prot.*, Ent., i, no. 1, pp. 191–261, 36 figs., 1 pl., 51 refs. Leningrad, 1930. (With a Summary in English.) [Recd. April 1931.]

A study of the Dipterous parasites of *Locusta migratoria*, L., was made in the summers of 1928 and 1929 in the breeding places of this locust in Kazakstan, Central Asia. Detailed accounts are given of the biology, as well as descriptions and figures, of the parasites concerned, *viz.*, *Blaesoxipha grylloctona*, Lw., *B. filipjevi*, Rohd., *B. lineata*, Fall., and *Acridomyia sacharovi*, Stack., as well as of *Brachymeria* (*Chalcis*) *dalmani*, Thoms., a parasite of *Blaesoxipha*. One individual of *Sarcophila latifrons*, Fall., was bred from a living locust. The principal parasite, especially at the end of the season, is *B. grylloctona*, which then parasitises the adults, and accounts for 70–85 per cent. of the total infestation.

In order to estimate the degree of infestation by parasites, sample lots of hoppers were taken every five days from a band reserved for this purpose. The collections were made early in the morning, while the hoppers were in a state of torpor owing to cold, by making sweeps with a net at definite intervals. From 15 to 25 sweeps were required for a band the size of which varied from 10 to 25 acres. Some of the hoppers thus obtained were dissected on the same day, but most of them were used for breeding out parasites, for which purpose they were placed in cylindrically shaped copper gauze cages, with perforated bottoms, to which tin containers were adjusted. These are described and figured. The emerging parasite larvae dropped into the container, and were daily registered and placed into jars of soil. At the end of ten days the surviving hoppers were dissected and the parasites that had not emerged were counted. Similar methods were employed in case of adult locusts.

It was found that 25–33 per cent. of the total number of parasites were not observed on dissection, and the author strongly recommends the method of breeding them out, which allows of both quantitative and qualitative estimation of infestation. The effects of the parasites on the life and fertility of the locusts are discussed, and the conclusion is reached that they do not constitute a factor regulating locust outbreaks.

[Makalovskaya (V. N.).] **Макаловская (В. Н.). On the biometrical Characteristic of the Races of the Asiatic Locust.** [*In Russian.*]—*Bull. Plant Prot.*, Ent., i, no. 1, pp. 263–274, 6 refs. Leningrad, 1930. (With a Summary in English.) [Recd. April 1931.]

Specimens of *Locusta migratoria*, L., from more southern parts of Russia approach in their biometrical characters the tropical subspecies *migratorioides*, R. & F. It is possible to separate biometrically specimens from different breeding areas.

Nazaroff (P. S.). **The rose-coloured Pastor and Locusts.**—*Ent. Rec.*, xliii, no. 2, pp. 31–32. London, February 1931.

Notes are given on the behaviour of *Pastor roseus*, which is an important enemy of *Dociostaurus maroccanus*, Thnb., in the Kirghiz

Steppes and Turkestan. The birds continue to destroy the locusts after their hunger is satisfied [but *cf.* *R.A.E.*, A, xix, 8], and they concentrate in enormous flocks when the locusts are on the ground before migration. It is essential for them to have water, not only for drinking but also for cleaning their beaks, and when locusts appear in waterless places, the natives dig special canals to bring water, sometimes for many miles.

ISAAC (P. V.). **Report of the Imperial Entomologist.**—*Sci. Rep. Imp. Inst. Agric. Res. Pusa 1929–30*, pp. 72–79, 1 pl. Calcutta, 1931.

An account is given of the work at Pusa in 1929–30 against insect pests, some of which were mentioned in the previous report [*R.A.E.*, A, xviii, 443]. The predominant sugar-cane borers in June were *Emmalocera depressella*, Swinh., and *Diatraea* spp., particularly *D. venosata*, Wlk. *Geoica spatulata*, Theo., occurred on the roots in November-December, and *Trionymus* (*Pseudococcus*) *sacchari*, Ckll., was injurious to ratoon canes. A study was made of *Indarbela tetraonis*, Moore, on mango, guava, *Eugenia jambolana* and *Zizyphus jujuba*; it was very destructive to grafted *Zizyphus* trees, planted for lac experiments. Injury was caused to mango grafts in the vicinity of Pusa by *Acrocercops syngramma*, Meyr., and to apples and peaches in Kumaon by a Cetoniid, *Protaetia neglecta*, Hope. A Tineid, *Stathmopoda* sp., is recorded as predacious on *Icerya purchasi*, Mask.

Pulses stored with mercury-tin amalgam [xviii, 30] between pairs of tiles in May 1929 were in good condition when examined in November. A few Bruchid eggs were observed on the seeds, but no damage was noticeable. It is believed that injury to seeds in other bags in this room was much less than in previous years, this probably being due to the presence of mercury vapour. Experiments were carried out to test the efficacy of storing grain with mercury on a large scale. After about 5 months a damp-proof bin of rice with the "amalgam tiles" contained large numbers of *Tribolium castaneum*, Hbst., but the loss was negligible. Adults and larvae of *Silvanus surinamensis*, L., were found in the bottom layer of the rice, and its presence was thought to be due to the tiles not being porous enough and to an insufficient quantity of amalgam. In an experiment in progress, tin boxes with perforated ends, capable of holding 2 oz. amalgam, are being used as receptacles.

JEPSON (F. P.). **A Note on the Destruction of the Nests of mound-building Termites.**—*Trop. Agriculturist*, lxxvi, no. 2, pp. 67–69. Peradeniya, February 1931.

The following method of destroying the nests of mound-building termites has proved successful in Ceylon and is recommended for extended trial. The mounds are levelled to the ground, the demolition of large ones being accelerated by blasting. A hole is driven about 18 ins. deep in the centre of the area previously covered by the mound, if no ventilating flue has been found to the nest, and similar holes are made round the centre one, about 18 ins. apart and about equidistant from the centre and the circumference of the whole area. One ounce of petrol is poured into each hole, which is then immediately plugged with soil to prevent the escape of the vapour. This treatment results

in the disintegration of the fungus combs on which the young termites feed after hatching. No survivors of treated colonies were found. Constant inspection should be made for new mounds, as these can be levelled without difficulty and the nests destroyed by treatment at a few points only.

HAZELHOFF (E. H.). **Proeven omtrent topboorderbestrijding in aanplant 1929–30.** [Experiments in the Control of the Tip-borer on Sugar-cane in 1929–30.]—*Meded. Proefst. Java-Suikerind.*, 1930, 53 pp. Pasoeroean, 1930.

This is a report on twenty-five plantation experiments in Java on the control of the white tip-borer of sugar-cane [*Scirpophaga intacta*, Sn.] by cutting out all infested shoots in cane 2½–3 months old, or in younger cane if infestation amounts to 5–10 per cent. [*R.A.E.*, A, xviii, 194]. The results, which are tabulated, were good in eight cases and very good in four others. Failures were due to inadequate care and supervision. It is concluded that if carried out thoroughly, this method reduces the injury to one-fifth of the normal, so that where it usually amounts to 8–10 per cent., a crop increase of 6 per cent. is attainable.

YUASA (H.). **A new Anthribid feeding on the Eggs of** *Kermes*. [*In Japanese.*]—*Oyo-Dobuts. Zasshi*, iii, pp. 21–25, 1 fig. Tokyo, 1931.

A description is given of the adult of *Brachytarsus kuwanai*, sp. n., which apparently has one generation a year and feeds on the eggs of *Kermes vastus*, Kuw., and *K. nawae*, Kuw., in Japan.

KATSUMATA (K.) & MURAE (K.). **Results of the Studies on** *Rhinoncus pericarpius*, **L.** [*In Japanese.*]—*Insect Wld.*, xxxiv, pp. 381–385, 401–406; xxxv, pp. 12–16, 49–53. Gifu, 1930–31.

Further details are given of the life-history of the weevil, *Rhinoncus pericarpius*, L. [*R.A.E.*, A, xviii, 556], which in recent years has been very injurious to hemp in the Ishikawa prefecture. The adults begin to be active from the end of April, mating taking place after 3–10 days, and oviposition 3–5 days later. The females usually oviposit in May, laying about 30 eggs in the young shoots of the food-plant. The egg stage lasts 3–8 days, and the larvae, which produce galls on the stems of the food-plant, mature in 16–23. Pupation takes place in the soil, and the beetles emerge from the middle of June to the end of July. They feed on the leaves for 2 or 3 weeks and hibernate without mating. The over-wintered beetles die at the beginning of July. A spray of nicotine sulphate or derris, combined with soap, is effective for control.

KONDO (T.) & MIYAHARA (H.). **Xyloryctidae of Japan and South Manchuria.** [*In Japanese.*]—*Insect Wld.*, xxxv, pp. 2–7, 38–44. Gifu, 1931.

In South Manchuria, *Odites malivora*, Meyr., which attacks apple leaves, usually along the edges, apparently has one generation a year, the moths emerging from the middle of July to the beginning of August.

O. ricinella, Staint., also has one generation a year. The winter is passed as a young larva, and pupation takes place from mid-June onwards, the moths emerging in July and August. The eggs are usually laid singly on the lower surface of apple leaves or on the branches, one female depositing an average of 569. The larvae hatch in 8 days, and feed on the leaves for 1 or 2 weeks, after which they seek sheltered places for hibernation.

TAKAHASHI (S.). **Introductory Notes on the Heat of stored Grain produced by injurious Insects.** [*In Japanese.*]—*Insect Wld.*, xxxv, pp. 8–12, 44–49, 74–78. Gifu, 1931.

Very little attention has been paid to the important problem of the heating of stored grain as a result of infestation by such insects as *Calandra* spp., Bruchids, *Sitotroga cerealella*, Ol., *Rhizopertha dominica*, F., etc. The heat prolongs the active period of the pests in the grain and also increases the injury. It is produced by the larvae, but not by the adults, and seems to have no connection with the fungi growing on the excreta or injured grain. When heavily infested with *Calandra*, stored rice reaches a temperature of over 33° C. [91·4° F.].

MATSUSHITA (M.). **On** *Lyctus linearis* **Goeze.** [*In Japanese.*]—*Insect Wld.*, xxxv, pp. 79–80. Gifu, 1931.

A description is given of the adult of *Lyctus linearis*, Goeze, which is recorded as attacking oak furniture in Hokkaido.

TAKEYA (C.). **A little-known Tingid,** *Monanthia salicorum* (**Baba**), **occurring in Japan (Hem. Het.).**—*Mushi* [*J. Fukuoka Ent. Soc.*], iii, no. 2, pp. 67–72. Fukuoka, 1930.

The Tingid, *Monanthia salicorum*, Baba, which is redescribed in detail, is very injurious to basket willow (*Salix purpurea*) in the central part of Japan.

TAKEYA (C.). **The Food-plants of** *Stephanitis globulifera*, **Mats.** [*In Japanese.*]—*Mushi* [*J. Fukuoka Ent. Soc.*], iii, no. 2, p. 72. Fukuoka, 1930.

Stephanitis globulifera, Mats., is very common in Kyushu, where it attacks *Pieris japonica*, camphor [*Cinnamomum camphora*], etc.

MURAYAMA (J.). **Révisions des familles des Ipides et des Platypides de Corée.**—*J. Chosen Nat. Hist. Soc.*, no. 11, pp. 6–38, 2 pls., 1 map, 1 fig., 144 refs. Keijo, 31st December 1930.

This revision of the Scolytids and Platypids of Korea includes notes on the distribution and food-plants of the various species. The new species described are: *Scolytus seulensis* on *Prunus yedoensis* and *Pyrus anzu*; *Cryphalus carpinivorus* on *Carpinus*; *Xyleborus seiryorensis* on *Alnus japonica*; and *Crossotarsus koryoensis*, a serious pest of oak.

ESAKI (T.) & HASHIMOTO (S.). **Report on the Leafhoppers injurious to the Rice Plant and their natural Enemies. 2.** [*In Japanese.*]—*Publ. Kyushu Imp. Univ. Ent. Lab.*, no. 2, 59 pp., 5 pls. Fukuoka, 1931.

The results of the life-history studies during 1930 on the more important species of Homoptera attacking rice in Japan are similar to those given in the previous report [*R.A.E.*, A, xviii, 555]. The brachypterous females of *Delphacodes striatella*, Fall., generally produce rather more eggs than the long-winged forms. The Dryinid, *Haplogonatopus japonicus*, sp. n., is parasitic on the nymphs of *Sogata* (*D.*) *furcifera*, Horv. The mature larvae leave their hosts and pupate on the undersides of the rice blades, and the adults emerge in about 10 days. The Stylopid, *Elenchinus japonicus*, sp. n., is also parasitic on *Sogata*, parasitism sometimes amounting to nearly 13 per cent. The larvae usually attack the reproductive organs, which show varying degrees of abnormality. The pupae are found on the sides of the host. A Nematode, *Mermis* sp., killed 70 per cent. of *S. furcifera* in 1929 near Oita, and 56 per cent. of *S. furcifera* and 43 per cent. of *Delphacodes oryzae*, Mats., in 1930 near Fukuoka. The Stylopid, *Tettigoxenos orientalis*, sp. n., is parasitic in *Parabolocratus prasinus*, Mats., and an Empid, *Elaphropeza* sp., attacks another Jassid, *Erythroneura limbata*, Mats. *Gonatopus tenuipes*, sp. n., and *Echthrodelphax bicolor*, sp. n., are also described, but the hosts are unknown.

Report of the Committee to formulate Plans for Investigations of the Codling Moth from Biologic and Control Standpoints.—*J. Econ. Ent.*, xxiv, no. 1, pp. 18–23. Geneva, N.Y., February 1931.

These brief notes on the results obtained by numerous workers in various parts of the United States constitute a valuable review of recent work on all aspects of the control of the codling moth [*Cydia pomonella*, L.].

SHERMAN (F.). **Census taking in Entomology.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 42–49. Geneva, N.Y., February 1931.

The following is substantially the author's abstract: Studies of insect fauna may throw light upon zones of distribution and destructiveness of insect pests and may give information on minor pests that have not been much studied, as well as on insects now unnoticed that may later become pests. In a relatively new country such as the United States, where introduced pests are already numerous and destructive, native insects may yet be expected to become so. Materials and data accumulated in faunistic studies are also of value in teaching.

CORY (E. N.). **Notes on the European Hornet.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 50–52. Geneva, N.Y., February 1931.

Vespa crabro, L., is increasing in Maryland, where the common lilac, of which stems up to an inch in diameter are gnawed and sometimes girdled, seems to be the preferred woody plant, and it appears to be extending its range in other States. Apples have been found to be attacked and hollowed out both on the ground and on the trees. Although the number of injured fruit observed was small, this wasp might well multiply sufficiently to cause considerable damage.

Filinger (G. A.). **The Effect of Temperature on Feeding and Development of the Greenhouse Leaf-tyer,** *Phlyctaenia ferrugalis* **Hb.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 52–54. Geneva, N.Y., February 1931.

In view of the fact that injury caused by insects is in a measure proportional to the amount of food eaten, an experiment was carried out to determine the total amount of food eaten at different temperatures by the larvae of *Phlyctaenia rubigalis*, Gn. (*ferrugalis*, auct.). The technique adopted is described.

Slightly more food (870 mg. dry weight) was consumed by 25 larvae at 20° C. [68° F.] than at 15° C. [59° F.] (868 mg.) but considerably less (815 mg.) at 25° C. [77° F.], with a further decrease (735 mg.) at 30° C. [86° F.]. The larval period at 86° F. was 11 days, whereas at 59° F. it was 58. A large number of the prepupae kept at 86° F. started to spin cocoons but died without pupating. This may explain why *P. rubigalis* is not troublesome during that part of the year when temperatures in greenhouses exceed 86° F. Many of the larvae kept at 59° F. died in the prepupal stage without attempting to spin cocoons; the larval period at this temperature was twice as long as at 68° F., although the amount of food consumed was about equal. Possibly the drain on the energy of the insect required to maintain its life for this length of time prevented the accumulation of sufficient reserve food to permit of pupation. The percentage of adults emerging was 46 at 68° F., 38 at 77° F., 12 at 59° F., and 8 at 86° F. It is therefore concluded that the optimum temperature range of *P. rubigalis* is somewhat limited.

Hutson (R.). **The Cherry Case-bearer,** *Coleophora pruniella* **Clemens, in Michigan.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 54–56, 5 refs. Geneva, N.Y., February 1931.

The present distribution and abundance of *Coleophora pruniella*, Clem., in Michigan is reviewed. Although mentioned as occurring periodically on wild black cherry ever since its description in 1861, it has only been known as a pest of cherry plantings during the last few years. In the generally infested area, all the eggs were deposited in 1930 between 15th and 25th July, the young larvae being abundant during the first two weeks of August. The joint results of counts of foliage loss due to mines of *C. pruniella* made on 6th and 11th August, when 90 per cent. of the larvae had hatched, show an infestation involving the direct loss of 6–13 per cent. of the leaves, with a further possible loss of 1–2 per cent. of the total leaves from injury caused by larvae hatching subsequently. The largest number of eggs observed on a single leaf was 23. Leaves were as certainly killed by one or two mines on the basal part as by several on the apical end.

Stearns (L. A.). **The Broods of the Plum Curculio,** *Conotrachelus nenuphar* **Herbst, in Delaware.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 62–66, 10 refs. Geneva, N.Y., February 1931.

Considerable uncertainty exists concerning the number of broods of *Conotrachelus nenuphar*, Hbst., that develop annually in those areas of the United States in which severe injury has been experienced. It is obvious from a brief review of the literature that only within the past

few years has the existence of two broods been recognised, and the cumulative data indicate the possible occurrence of either a whole or a partial second brood further and further north throughout the general area of distribution.

Preliminary observations in Delaware indicate that climatic factors, notably temperature and precipitation, may not be the primary agencies contributing to the development of two broods in a given year, and suggest the possible existence of one and two-brooded strains of this weevil. In 1930, notwithstanding the fact that emergence of the first brood of adults commenced on 27th June, only a certain group emerging between 3rd and 10th July deposited eggs between 12th and 18th July from which second-brood adults were reared. During 1930, the first appearance of *C. nenuphar* from hibernation and the first emergence of mature first-brood larvae from fallen peaches occurred four weeks earlier, and the first adults of the first brood three weeks earlier in Georgia than in Delaware, but the first deposition of the second-brood eggs was recorded on approximately the same date.

Plans are being formulated for the investigation of the development of *C. nenuphar* under conditions of regulated temperature and humidity and for the cross-breeding of one and two-brooded strains from Delaware, supplemented by breeding studies with material from sections of the country in which the weevil is normally two-brooded, occasionally two-brooded and normally one-brooded.

HARTZELL (F. Z.) & GAMBRELL (F. L.). **Relation of Environment to Pear Psylla Infestation.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 66–71, 2 refs. Geneva, N.Y., February 1931.

A preliminary report is given of the progress of a study in New York State, begun in 1927, with the object of determining the natural factors that render pear trees unfavourable to the multiplication of *Psylla* (*Psyllia*) *pyricola*, Först.

The following is taken from the authors' abstract and conclusions: It was found that the heavily infested trees were usually situated in sheltered places, and that orchards in which the insect generally was scarce were exposed to the north, north-west or west winds. It is believed that the chief influence of wind occurs at the time of autumn dispersion, when the migrants seek trees in sheltered places. Part of the effect may be due to the action of storms, which wash some of the nymphs from the trees where the latter are not protected. The aim of the project is to determine the amount of shelter that should be removed or avoided to give the minimum infestation, with the object of being able to assist pear growers in determining how to change existing conditions or to set out new orchards where danger from infestation would be greatly reduced. Additional investigation is planned to secure further data on the problem, which appears important in view of the possibility of reducing the cost of control of *P. pyricola*.

HARTZELL (F. Z.). **Investigations aimed at reducing the Cost of Pear Psylla Control.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 71–77, 2 refs. Geneva, N.Y., February 1931.

Owing to the narrow margin of profit accruing from the cultivation of pears in New York, the factors concerned in which are discussed in some detail, it has become necessary to exercise the greatest economy

in controlling *Psylla pyricola*, Först. This can be effected by reducing the amount of the ingredients in insecticides, by using cheaper materials, or by developing systems that lessen the number of treatments. Experiments tend to show that the percentage of oil can be reduced and that with the use of Bordeaux mixture (2–40–100) the content of nicotine can be considerably lowered, without decreasing the toxicity to *P. pyricola* [*R.A.E.*, A, xviii, 404]. Pear orchards can be rendered unfavourable to pear psylla by modifying the environment, thus diminishing the number of treatments [see preceding paper]. The use of lubricating oil emulsions as dormant sprays effects economy by being cheap and at the same time reducing the number of treatments. Caution must, however, be exercised in the use of these emulsions since they are toxic to weak trees, especially when applied for several years in succession.

FLUKE, jr. (C. L.) & ALLEN (T. C.). **The Role of Yeast in Life History Studies of the Apple Maggot,** *Rhagoletis pomonella* **Walsh.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 77–80, 5 refs. Geneva, N.Y., February 1931.

In the course of studies in Wisconsin to discover a convenient technique for rearing *Rhagoletis pomonella*, Walsh, 1–3 per cent. yeast in 5 per cent. honey water gave the best results for feeding the adults, 306 flies fed on this substance living on an average 32 days, and many of them 50–60. Regular daily feedings were necessary, an omission of a day often causing high mortality. A drop of the mixture placed on or near the proboscis revived starving flies if they were able to feed, though the liquid did not seem to attract them from any great distance. The rearing cage found most suitable for use in the orchard was made of a cylinder of screen wire 8 inches long by 4 inches in diameter. Each end was open but with a sleeve of muslin sewed on to it to allow the cage to be slipped over a twig containing foliage. The muslin ends were then tied to the branch. In the lower side of the cage was placed a small wire basket holding a small vial to contain the feeding solution. This vial contained a narrow strip of blotting paper, which acted as a wick and allowed the flies to alight and feed. The vials were replenished daily and the blotting paper soaked by means of a medicine dropper, and a new wick was inserted and the vial cleaned every alternate day through a separate opening on the lower side of the cage. Two types of cage used in the laboratory, each giving excellent opportunities for the study of all stages of the life-history of *R. pomonella*, are also described.

Instances of the use of yeast as an aid in rearing other flies are cited from the literature.

CUTRIGHT (C. R.). **Some Laboratory Reactions of young Codling Moth Larvae.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 81–83. Geneva, N.Y., February 1931.

The results of an experiment carried out during August 1930 in Ohio, in which 40 newly-hatched larvae and 40 eggs of *Cydia* (*Carpocapsa*) *pomonella*, L., were placed on each of 4 lots of 20 apples in constant temperature cabinets at four different temperatures falling within the normal summer range, show that there is a direct correlation

between temperature and the ability of the larvae to established themselves. At 59° F. no larvae entered the fruit, whereas at 86° F. the fruit was covered with entrances. A further experiment showed that high temperatures are decidedly favourable to larvae entering the fruit even when it is thoroughly covered with spray material. The effect of the temperature was exercised directly on the larvae and not on the fruit.

HODGKISS (H. E.) & HALEY (D. E.). **A Study of arsenical Residues on Apples in Pennsylvania with Respect to efficient spraying Practices, II.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 83–88, 1 ref. Geneva, N.Y., February 1931.

In one region of Pennsylvania, where apples are grown mainly for shipment, an attempt is made to eliminate the midsummer arsenical spray where fruit is grown for export, though in other districts where rains are usually abundant and the fruit is intended for home consumption, midsummer applications of arsenicals are advisable. A study of arsenical residues in which both the system of spraying followed and the method of analysis used were the same as those employed in 1926 [*R.A.E.*, A, xvi, 83], which was a wet year, was carried out in the summer of 1930, which was unusually dry, *Cydia pomonella*, L., being abnormally abundant. Owing to the dry conditions, only 5 cover sprays were applied instead of the normal 6, and the last regular treatment was recommended for the period 10th–15th July, whereas under normal conditions of rainfall it would have been given 10–15 days later. In 107 orchards where the sprays were timely and thoroughly applied, the percentage of damage from plum curculio [*Conotrachelus nenuphar*, Hbst.] was 2·1, and from codling moth [*Cydia pomonella*, L.] 1·3. Records taken from orchards where spraying had not been timely or critical treatments had been omitted showed corresponding damage of 12·8 and 10·7 per cent. The final or mid-July application of lead arsenate was of the greatest importance in the area where abnormal temperature and rainfall had resulted in increasing seasonal activities of both pests. Many plantings in which it had been omitted exhibited injuries from the second brood of *C. pomonella* that were often as high as 31 per cent.

Analyses showed that 77 out of 100 samples from orchards situated in 41 counties were below both domestic and world tolerance, 11 equalled or just exceeded world tolerance, 11 others equalled or were less than domestic tolerance, and one exceeded domestic tolerance. The maximum amounts of arsenic were from orchards where the spray coverage of the fruit was rather heavy and no washing rains had occurred from the time the spray was applied until the samples were taken. Handling the fruit reduced the arsenic content appreciably.

CAMPBELL (F. L.) & LUKENS (C.). **A radioactive Indicator Method for estimating the Solubility of Acid Lead Arsenate within the Alimentary Tract of the Silkworm.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 88–94, 1 fig., 5 refs. Geneva, N.Y., February 1931.

The following is the authors' abstract: By the use of the radioactive indicator method, the rate of evacuation of lead by the silkworm, *Bombyx mori*, L., was determined following the administration of a

known dose of acid lead arsenate. It was shown that at least 25 per cent. of a moderate lethal dose of acid lead arsenate goes into solution within the gut of the silkworm during its survival period. Acid lead arsenate was found to be much more soluble than basic lead arsenate within the gut.

WEED (A.). **Problems in the Manufacture of Liquid Household Insecticides of the Petroleum Extract of Pyrethrum Type.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 95–97. Geneva, N.Y., February 1931.

The manufacturer of liquid petroleum extracts of pyrethrum is often seriously handicapped as regards knowledge concerning the raw material used and the methods by which the highest degree of efficiency in manufacture can be obtained. As the effectiveness of the finished insecticide is very largely dependent upon its content of the active principles of the drug, the importance of the quality of the flowers cannot be over-emphasised. Trade grading, which depends upon the stage of maturity of the flowers and their geographical source, cannot be accepted as a criterion of their toxicity, which should be determined by chemical or biological means. Pyrethrum is available either as a powder ground to varying degrees of fineness or as a prepared extract of variable concentration. The toxicity of excellent flowers can easily be destroyed by heat developed in the mill, and losses occurring through inefficient extraction are one of the chief manufacturing difficulties. Although the use of concentrated extracts has lessened some of these difficulties, it does not give as complete control over the finished product.

Kerosene is the most satisfactory petroleum distillate for use with pyrethrum, as it extracts the toxic principles with a limited amount of inert matter and possesses a sufficiently high flash point to minimise the danger from fire. Care should be taken that the distillate used is neither too volatile nor too heavy. A suitable perfume for masking the disagreeable odour of petroleum hydrocarbons should possess volatile characteristics approximating to that of the oil with which it is blended. If it volatilises too quickly, the odour of kerosene will remain, but on the other hand it is not desirable that the perfume should linger after the kerosene has gone.

RICHARDSON (H. H.). **An insecticidal Method for the Estimation of Kerosene Extracts of Pyrethrum.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 97–105, 1 pl., 2 graphs, 12 refs. Geneva, N.Y., February 1931.

The following is the author's abstract : A method for evaluating pyrethrum extracts is described. It was found that different strengths of pyrethrum extracts vary directly in the speed with which they paralyse flies. A series of similarly performed tests indicated that the reproducibility of the results is great, especially the values for speed of paralytic action. Percentage mortalities produced by such a series extended over a wider range, but statistical analysis indicated that this variation was well within the limits of error due to random sampling. Typical paralytic curves are shown, and the value of the 50 per cent. paralytic point (the time when 50 per cent. of the insects are paralysed) for making comparisons is pointed out. For a series of various con-

centrations of pyrethrum extracts, the differences in mortality were not very great. This criterion of toxicity can only be used for diagnosing differences between extracts that differ widely in concentration. Differences in speed of paralytic action between a ¾ lb. and a 1 lb. extract of a fairly powerful grade of pyrethrum powder (0·26 per cent. Pyrethrin I) were easily distinguishable and were found to be clearly significant as indicated by statistical analysis. The differences in percentage mortality, analysed similarly, were not significant.

FELT (E. P.) & BROMLEY (S. W.). **Tests with Nicotine Activators.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 105–111, 6 refs. Geneva, N.Y., February 1931.

A series of field tests was conducted with nicotine in conjunction with Penetrol, Sunoco oil, Volck oil, commercial soap flakes, sodium oleate, potassium oleate and Kayso calcium caseinate against *Chermes* (*Adelges*) *abietis*, L. (spruce gall aphis), *Myzus cerasi*, F. (black cherry aphis), *Aphis spiraecola*, Patch (spiraea Aphid) and certain brown Aphids on conifers. The results secured indicate that the efficiency of nicotine activators is dependent on a complex of conditions in which the stage of the insect, the type of the plant, the spreading and wetting qualities of the spray, the rapidity of the evolution of nicotine, and the weather, temperature and humidity conditions are all factors.

DARLEY (M. M.). **Some comparative Tests with Rotenone, Nicotine and Pyrethrum.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 111–115. Geneva, N.Y., February 1931.

The following is the author's abstract : Rotenone at a concentration of 1 : 100,000, as a contact poison in spray form, was found to compare favourably with nicotine at 1 : 10,000 and pyrethrins at 1 : 74,800, with penetrol at the same concentration (1 : 200) in each spray, in tests against *Aphis* (*Rhopalosiphum*) *pseudobrassicae*, Davis (false cabbage Aphid) in the field and *A. spiraecola*, Patch (spiraea Aphid), in the laboratory.

Against adults of *Diabrotica duodecimpunctata*, F. (spotted cucumber beetle) and *Epilachna corrupta*, Muls. (Mexican bean beetle), pyrethrins at 1 : 37,400 were effective, whereas nicotine at 1 : 5,000 and rotenone at 1 : 50,000 were ineffective, with penetrol at 1 : 100 in each spray. A rotenone concentration of 1 : 1,000 (plus penetrol 1 : 200) was necessary before a mortality above 90 per cent. was secured with adults of *D. duodecimpunctata*.

Some preliminary tests with *Tetranychus telarius*, L. (common red spider) indicate that the relative toxicity of rotenone to this pest as compared with the toxicity of nicotine and pyrethrins, is appreciably greater than its relative toxicity as indicated in the Aphid test.

RUGGLES (A. G.). **Preliminary Notes on the Biology and Control of the Pine Leaf Scale,** *Chionaspis pinifoliae* **Fitch.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 115–119. Geneva, N.Y., February 1931.

Chionaspis pinifoliae, Fitch (pine leaf scale) is well distributed in natural forests throughout Minnesota, where it has recently been increasing in abundance and importance, particularly in nurseries and

ornamental plantings, without causing notable damage under forest conditions. Although in 1926, 90 per cent. control was obtained with nicotine and soap, the trees were as badly infested as ever in 1927, a second generation having occurred unnoticed after the spraying programme was over. Experimental work in 1927 and 1928 showed that the scale could be controlled by careful applications of Volck oil and nicotine, but a further study was begun in 1930 with a view to devising better spraying compounds. Observations in the most seriously infested areas showed that whereas the eggs hatched at Lake City on 6th May and at St. Paul on 10th May, at Faribault, 60 miles south of St. Paul, but in about the same latitude as Lake City, eggs did not begin to hatch until 3rd June, the subsequent development of the scale being later and slower there throughout. Further observations showed that *C. pinifoliae* has two generations a year at St. Paul and Lake City, and only one at Faribault. A comparison of dates of the first and last frosts in each region shows a growing season 15 days longer where two generations occur. The factors likely to govern the numbers of generations occurring are discussed.

Experiments with various sprays on small pines and spruces showed that *C. pinifoliae* can be controlled by the application in the middle of the hatching season of 2 per cent. White Rose oil; 2 per cent. Volck light oil; 1 per cent. Volck light oil with nicotine sulphate; nicotine sulphate and soap; or lime-sulphur at strengths varying from 1 : 40 to 1 : 7. Lime-sulphur, 1 : 7, applied in July produced slight scorching but no ill-effects were noticed later in the season. No injury was observed with the other strengths or with lime-sulphur 1 : 7 in months other than July, nor with the oils except in one case with White Rose. Eggs of the first generation, after treatment with lime-sulphur, remained apparently healthy for weeks up to the time of collapse, but in the case of the other sprays the effect on the eggs was more rapid.

Robinson (R. H.). **Organic Solvents for aiding the Removal of Spray Residue from waxy or Oil-covered Fruit.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 119–125. Geneva, N.Y., February 1931.

Preliminary laboratory experiments indicate that the addition of certain organic solvents such as alcohol, benzene, acetone or kerosene to the hydrochloric acid washing solution facilitates in certain cases the removal of arsenical spray residues from fruit that is coated with oil spray or excessive wax formation [*cf. R.A.E.*, A, xix, 307]. Where wide variations occur in the residue load on individual fruits, or when the residue is badly coated with oil or accumulated wax, heating the acid solution still remains the most effective procedure, but where the analysis is consistently only a little above tolerance, the addition of the organic solvent to the acid would lower the residue below this limit, and occasionally for very bad cases a combination of warm acid and the organic solvent may prove necessary and advantageous. Where conditions are favourable for the use of solvents, kerosene appears to be the most effective. In flood type washing machines where sufficient agitation occurs, unemulsified kerosene may be used, but in jet type machines an emulsion must be prepared. Organic solvents must never be used in the flotation type of machine where little or no agitation occurs. No injury was caused to waxy or oil-covered fruit by the use of 2 per cent. kerosene even when the acid was warm.

Wolcott (G. N.). **The Initiation of Entomological Extension Work in Haiti.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 131–141. Geneva, N.Y., February 1931.

The most obvious of the many difficulties attending the initiation of entomological extension work in Haiti, where no previous work had ever been done on a scientific basis, was the complete absence of important insect pests susceptible to artificial control on any of the major crops. Thus the cotton growers claim that although *Alabama argillacea*, Hb., occurs in great abundance, its presence is favourable to a large production of bolls and that the repeated defoliation involved merely prevents the plants from growing too tall. *Pinnaspis* (*Hemichionaspis*) *minor*, Mask., although widely distributed in Haiti and abundant on tree cotton plants several years old, is not a serious pest in commercial fields, rarely infesting more than the base of the plants. The custom of cutting off the old plants at the surface of the ground and burning them after picking is finished effectually prevents the scale from becoming abundant. The introduction of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., into Haiti in 1923 caused no apparent decrease in production, since it merely resulted in the elimination of all kinds of cotton other than the native variety, which constituted the bulk of the commercial crop and was practically immune from attack [*cf.* *R.A.E.*, A, xvi, 50]. Although native cotton is highly susceptible to boll rots, native growers belittle the losses suffered, and refuse to be convinced of the connection between them and *Dysdercus andreae*, L., which they therefore see no reason for attempting to control.

The outstanding pest of sugar-cane in Hispaniola, the butterfly, *Calisto pulchella*, Lathy, which causes great damage in the extensive plantings in the Dominican Republic at the other end of the Island, is not sufficiently numerous in the smaller fields in Haiti to warrant attempts at commercial control. Reference is made to an attempt to control an outbreak of *Stenocranus* (*Saccharosydne*) *saccharivorus*, Westw., on sugar-cane with calcium cyanide dust.

Cosmopolites sordidus, Germ., an introduced pest that was causing considerable injury to bananas, was eventually controlled by persuading the peasants to plant only a variety of banana that had been proved to be resistant to its attack.

The necessary experience and training of personnel was only obtained by working with insects attacking ornamental plants and minor crops, such as *Aleurocanthus woglumi*, Ashby, on *Citrus*, and *Aulacaspis pentagona*, Targ., on peach, but after three years of varied and preliminary work, a reasonably equipped force of men was promptly available to demonstrate methods of control of the numerous pests of tobacco when a change in the tariff suddenly stimulated the production of this crop.

Leonard (M. D.). **Entomology in Puerto Rico during the past Decade.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 141–151. Geneva, N.Y., February 1931.

A brief review, mainly taken from the literature, is given of the more important entomological activities carried out in Porto Rico during the years 1921–1930, with mention of the principal workers and suggestions as to future lines of investigation.

Hartzell (F. Z.). **Ecotopographic Maps: their Use in Entomology and Notes on Making.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 151–157, 1 fig., 8 refs. Geneva, N.Y., February 1931.

The following is the author's abstract: Ecotopographic maps [on which the topographical concept is applied to land, water, vegetation, abundance of animal life and other quantitative data], together with special contours [showing equal values of the several characteristics], are defined. Their uses for assisting in the investigation of the relation of insects to environment and for illustrative purposes are set forth. The features to be shown on such maps and notes on the methods of making are given.

Felt (E. P.) & Bromley (S. W.). **Observations on Shade Tree Insects.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 157–162. Geneva, N.Y., February 1931.

The dry weather of 1929 and 1930 was unusually favourable to *Galerucella luteola*, Müll. (*xanthomelaena*, Schr.) (elm leaf beetle) in the north-eastern United States, and increased injury is probable in 1931. Early and abundant Tachinid oviposition upon recently moulted larvae of *Datana integerrima*, Gr. & Rob., is recorded. A brief account is given of the life-history and habits of *Nepticula sericopeza*, Zell., together with recommendations for its control [*R.A.E.*, A, xix, 206]. Examination of seeds dropped from Norway maple [*Acer platanoides*] in 1930 showed infestation in 99 per cent. of the earlier dropping larger seeds, but less than 14 per cent. of the smaller seeds falling at the same time had been attacked. Data are given showing that adults of *Agrilus bilineatus*, Web. (two-lined chestnut borer) feed readily on the foliage of red or black oak, but die within 24–48 hours when restricted to feeding on foliage previously sprayed with poison. A species of *Prionus*, probably *P. laticollis*, Drury, was found causing injury to rhododendrons, the foliage of infested plants being yellow and scanty and the stems weak. The larvae, three of which were found at the base of one stem, one in a root ¾ in. in diameter, were destroyed by the application of carbon bisulphide, but its effect on the plants is not known.

Details are given of the hibernation of *Phylloxera caryaecaulis*, Fitch, on hickory in the egg stage. A spray of ½ U.S. pt. nicotine, 3 lb. soap, 9 lb. molasses and 40 U.S. gals. water, or a thorough dormant oil application, before the swelling buds are ½ in. long, is recommended for the control of the young Aphids immediately after hatching and before they have obtained the protection of the gall tissues. Tests carried out against *Chermes* (*Adelges*) *abietis*, L., and *C.* (*Gillettea*) *cooleyi*, Gillette, show that both these Aphids can be controlled on spruce by thorough spraying with any of a number of contact insecticides. An infestation of *Aphrophora parallela*, Say (pine spittle insect), observed on 13th June, showed as many as 35 spittle masses to a branch, the adults beginning to appear on 30th June. This Cercopid was decidedly more abundant on Scotch pine [*Pinus sylvestris*] than on other pines. *Chionaspis euonymi*, Comst. (euonymus scale) hibernates as an almost mature female and probably has three generations a year, small scales having been observed on 8th June, 19th July and in October. It may be kept in check by thorough spraying with Sun oil, 1 : 15, just before the new growth starts, without causing injury to the trees.

HAMILTON (C. C.). **Tests on the Control of several Insects attacking Ornamental Plants.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 162–169, 1 ref. Geneva, N.Y., February 1931.

The following is taken from the author's abstract on work in New Jersey: *Rhyacionia buoliana*, Schiff. (European pine shoot moth) was controlled by spraying infested trees during June with penetrol, 1 : 200, plus 40 per cent. nicotine sulphate, 1 : 500. Three sprays applied at intervals of 7–10 days killed the adults hiding in the trees and the eggs laid upon the terminal twigs. *Dichomeris marginella*, F. (juniper webworm) was also effectively controlled by means of several summer contact sprays applied in May or early June against the larval stages before the adults had an opportunity to emerge and lay eggs on other plants. Adults of *Otiorrhynchus* (*Brachyrrhinus*) *sulcatus*, F., the larvae of which were feeding on the roots of yew (*Taxus*), were successfully controlled by means of a bait consisting of apple scraps impregnated with 3½ per cent. sodium fluosilicate. Tests against thrips infesting privet showed that dust insecticides were more effective than liquid sprays and that the best materials were dusts containing nicotine tannate or ground pyrethrum flowers. Against *Eriophyes ulmi*, Garman (elm mite), sprays or dusts containing sulphur were much more effective than sprays containing pyrethrum extract.

CORY (E. N.), GRAHAM (C.) & LANGFORD (G. S.). **Additional Data on the hot Water Treatment of** *Buxus*.—*J. Econ. Ent.*, xxiv, no. 1, pp. 169–171, 1 pl., 1 ref. Geneva, N.Y., February 1931.

Further experiments in the treatment of boxwood plants infested by *Monarthropalpus buxi*, Lab., with hot water [*R.A.E.*, A, xviii, 574] show the treatment to be effective and safe when applied in spring after mild weather has set in and before emergence has occurred, but inadvisable, though effective, in autumn under conditions prevailing in Maryland. In every case *M. buxi* was killed and there was no trace of reinfestation, but of the bushes treated in November 1929 a large proportion, amounting in one case to 73 per cent., was either killed or rendered commercially worthless. Although 8 per cent. of the trees treated in spring were killed and 2·9 per cent. showed commercial damage, their destruction was attributable to other causes.

The costs varied from 5*d*. to 10*d*. a plant with the different types of equipment used, a description of which is given, and with the quality of the labour employed; they were higher than in the previous year owing to the necessity of transporting the plants for a distance of 5 miles.

FRIEND (R. B.). **The Life History and Control of the Birch Leaf-mining Sawfly,** *Fenusa pumila* **Klug.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 171–177. Geneva, N.Y., February 1931.

Fenusa pumila, Klug, which was first reported in the United States in 1924, is now present in the north-eastern part of the country and in south-eastern Canada (New Brunswick). All stages are described. In Connecticut, there are at least three generations a year and sometimes a partial fourth, about six weeks being necessary for the completion of one generation in summer. The first adults appear in the neighbourhood of New Haven about 12th May and lay their eggs in the young developing leaves of the birch, the oviposition of this

generation continuing until 10th June. Females begin to oviposit within 24 hours of the time of emergence from the soil. The egg generally hatches within 6–9 days, but in some cases this stage lasts 13 days. The larval period in the leaf lasts 11–15 days, the largest number of larvae found in one leaf being 63, although the average is considerably less. Most of the larvae become full-grown in 10–12 days, after which they emerge from the leaf and drop to the ground, burrowing in an inch or two before forming the cocoon. During the summer the prepupal stage usually lasts 9–15 days and the pupal stage 5–8. The total period spent in the soil in summer lasts 12–51 days, but the great majority of individuals emerge in 15–24. From August onwards an increasing proportion of the larvae remain in the soil to hibernate, and although adults have been secured as late as the first part of October, they are very few in number. In 1930 the last larvae of the season had all disappeared by 26th September. On birch sprouts, which grow rapidly and produce new leaves in abundance throughout the growing season, a heavy larval infestation occurs from the end of May till the end of September, but on well-grown trees, the foliage of which hardens in midsummer, the larval infestation drops off sharply after the second generation has matured. The generations are distinct in the early part of the summer, but after this there is so much overlapping that all stages are found simultaneously. Oviposition causes discoloration of the leaf tissue, and larval feeding arrests leaf growth locally, resulting in wrinkling and asymmetrical leaf shape. If the insect is abundant, the leaves are killed and drop off, leaving the terminal twigs bare, with a possibility of abnormal development of lateral shoots from affected branches.

It is very difficult to kill the larvae within the leaves, but applications of nicotine sulphate either with or without soap in concentrations as low as 1–1,500 in water have killed between 90 and 100 per cent. of the eggs. The nicotine sulphate contained 40 per cent. nicotine and the soap contained 9·25 per cent. moisture and 62·89 per cent. soap, much of the remainder being sodium silicate. The addition of penetrol added but slightly to the ovicidal properties of this spray, and a pyrethrum-soap compound containing 67 per cent. inert ingredients gave markedly inferior results. In order to protect birch trees from attack, it is necessary to spray for the first two generations, five sprays being required under New Haven conditions, three one week apart beginning on 20th May, and two one week apart beginning on 30th June.

SCHOENE (W. J.). **Leafhopper Studies during 1930.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 177–180, 2 refs. Geneva, N.Y., February 1931.

Insectary studies and field observations of leafhoppers in apple orchards in Virginia [*R.A.E.*, A, xviii, 401] were continued in 1930, when an opportunity was afforded to study the effect of prolonged and severe drought on the numbers present. The period during which eggs were being deposited in the insectary was much shorter than in 1929, and all the first-brood nymphs had matured by 1st August, whereas in 1929 first-brood nymphs of *Erythroneura obliqua*, Say, were present until 15th August and those of *E. dorsalis*, Gill., until 5th September. In 1930, first-brood nymphs of *Typhlocyba pomaria*, McAtee, were present from 10th June to 15th July and second-brood adults from 20th August till 5th October. The incubation period of eggs deposited in June was in some instances 50 days.

Dry weather appears to be favourable to leafhoppers on the whole, but the extreme drought of the 1930 season had an unfavourable influence on the first brood of *T. pomaria*, shortening adult longevity and the oviposition period. Only in certain favourably situated sections did the first brood deposit sufficient eggs to produce an injurious second brood. *E. obliqua*, *E. dorsalis*, and *E. harti*, Gill., were present in very small numbers until September when they became very numerous. In October *Erythroneura* spp. greatly outnumbered *T. pomaria*.

HARMAN (S. W.). **The Cranberry Rootworm as an Apple Pest.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 180–182, 1 pl. Geneva, N.Y., February 1931.

Considerable injury has been caused for a number of years to apples in western New York by the adults of *Rhabdopterus picipes*, Ol., which is widely distributed throughout the United States as a pest of cranberry, the roots being attacked by the larvae and the fruit and foliage by the beetles. Damage caused to apples, which during 1928 amounted in one case to 70 per cent. of the crop, renders the fruit unmarketable except for canning or evaporated stock. About 10 months of the year is spent in the larval stage either on the surface of the ground or beneath it during hibernation. The larvae feed on the roots in turf beneath the trees in the orchard. Pupation takes place during May just below the surface, and the adults are present in the orchard during June and July. Eggs are laid just beneath the surface of the soil in litter on the ground. A list of 20 plants attacked by the adults is given, and the injury caused to the fruit and foliage of apple is described. Practically all cases of damage observed have occurred in turf orchards, sandy types of soil being apparently favoured. Data are recorded concerning experiments in the control of *R. picipes* with lead arsenate. Two applications of 3 lb. lead arsenate in 100 U.S. gals. spray gave satisfactory control, the first being made on 11th June when approximately 50 per cent. of the larvae had entered the pupal stage and 5 days before the appearance of the beetles, and the second 12 days later when the beetles were most numerous. One application of 3 lb. lead arsenate generally proved inadequate, but one application of 6 lb. lead arsenate, 1 U.S. qt. fish oil and 100 U.S. gals. lime-sulphur, 1–40, gave a high degree of control.

For adequate protection where codling moth [*Cydia pomonella*, L.] is also present, one additional spray, timed with reference to the development of *R. picipes*, should be included in the regular spray schedule, followed by a second application corresponding with the first cover spray against *C. pomonella*.

HERVEY (G. E. R.) & HARTZELL (F. Z.). **Influence of Planting Dates of Sweet Corn on European Corn Borer Infestation.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 183–188, 1 map, 4 refs. Geneva, N.Y., February 1931.

Experiments in New York State dealing with the time of planting maize in relation to infestation by *Pyrausta nubilalis*, Hb., are described. The results indicate a certain stage in the growth of the variety of maize studied when it is most susceptible to attack. Early-planted

maize is more heavily infested than that planted later, and the differences become greater as the dates of planting are more widely separated. In one experiment, however, the maize first planted appeared to have developed beyond the susceptible stage by the time of attack. A comparison between infestation and planting dates would seem to indicate that, at least during 1930, maize planted in light soils was more seriously attacked because it was put in the ground earlier than maize planted on heavy soils, so that other edaphic factors were possibly not responsible. It would appear that under conditions prevailing in 1930, the type of maize studied, if planted on 1st June or later, would escape serious infestation at the localities in which the experiments were conducted. It is also possible that maize planted very early on light soils will pass the susceptible stage before oviposition takes place.

Glasgow (H.). **The present Status of Carrot Rust Fly Control in New York.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 189–196, 2 pls. Geneva, N.Y., February 1931.

Injury by *Psila rosae*, F. (carrot rust fly) may be prevented or greatly reduced by regulating the planting and harvesting dates so that the growing period falls between the first and second broods [*R.A.E.*, A, xvii, 453]. This method of cultivation, however, limits the growing season in badly infested districts to 3–3½ months, within which period it is hardly possible to secure either a full yield or carrots of maximum size, and necessitates harvesting the crop at a specified time irrespective of convenience or the state of the market. It has, however, been found possible by the use of crude naphthalene, the most satisfactory of a number of materials tested, to extend the growing season 1–2 months without seriously increasing the danger of larval injury or causing damage to the growing plants. Weekly applications of naphthalene, distributed evenly by hand over the field at the rate of 400 lb. to the acre, commencing on 28th July when the flies of the second generation began to appear and continued to within approximately one month of the proposed harvesting date, reduced the total injury from nearly 100 per cent. in the untreated control plot to less than 3 per cent., and increased the yield of marketable carrots by 37 tons to the acre. In the plot where the last two applications were omitted, the total infestation was 97 per cent., but the actual degree of injury was much less than in the untreated plot.

Mundinger (F. G.). **The Pear Midge.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 196–200, 1 diag. Geneva, N.Y., February 1931.

Contarinia pyrivora, Riley, is a serious pest of pears in the Hudson Valley and in some other parts of New York State. The adults emerge from the overwintered pupae in spring about the time the fruit buds are breaking, and the eggs, which are laid inside the individual cluster buds, hatch in about 4 days under favourable weather conditions. The interval of time between emergence and oviposition varies considerably from year to year, in some instances lasting a week, and in others several weeks. The larvae find their way into the ovary of the future blossom and feed on the tender tissues, causing the young fruit to develop abnormally. The small fruits drop prematurely, and the mature larvae burrow a short distance into the soil, where pupation takes place.

From life-history studies and control experiments carried out during the past few years [*R.A.E.*, A, xvii, 367], it appears that *C. pyrivora* may be best controlled in the adult stage by sprays containing nicotine sulphate applied when the cluster buds begin to swell so that the sepals pull apart. Satisfactory results have been obtained with $\frac{3}{4}$ U.S. pint to 100 U.S. gals. in combination with lime-sulphur (1 : 40 or stronger), 2 per cent. Volck oil emulsion, or 6 lb. fish-oil soap, and with 1 U.S. pint in combination with Bordeaux mixture (2 : 10 : 100). The treatments are made as the first trace of pink of the petal is seen, and the entire tree should be well covered so that all flies resting on the trunk and lower limbs are thoroughly wetted by the spray. In this way females are killed before many eggs are laid. The critical period for spraying is sometimes as short as two or three days, although under weather conditions that are adverse for tree development it may last a week. The best results have hitherto been secured with two applications, but with exact timing one thorough cover should give good protection.

HUCKETT (H. C.). **The Tolerance of Beans to Sprays and Dusts for the Mexican Bean Beetle.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 200–204. Geneva, N.Y., February 1931.

In view of the fact that *Epilachna corrupta*, Muls., though not yet of economic importance, has been evidently on the increase in the neighbourhood of New York during 1929 and 1930, tests have been made of the effects of various insecticides on bean foliage. It was found that considerable risk was involved in the use of certain forms of arsenical, magnesium arsenate being the only one that could be used with any degree of safety in spray form and giving the best results when used as a dust. The fluosilicates compared very favourably with magnesium arsenate as dusts or sprays, cryolite being inferior to barium fluosilicate when used as a dust. In the cases of magnesium and calcium arsenates, the results were improved when the dust mixtures were applied to plants with dry foliage as compared with foliage moistened with dew, but this did not hold good in the case of the fluosilicates.

HALLOCK (H. C.). **Recent Observations on the Distribution and Abundance of** *Anomala orientalis* **Waterhouse and** *Aserica castanea* **Arrow in New York.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 204–212, 3 figs., 6 refs. Geneva, N.Y., February 1931.

The range of *Anomala orientalis*, Waterh., and *Aserica castanea*, Arr., in New York State is recorded for the past four years, and notes are given on their general abundance [*cf. R.A.E.*, A, xvii, 444]. Although the numbers in the dense infestations were reduced by the severe drought occurring in 1929, the beetles have been observed over a larger territory in New York in 1930 than at any earlier period. Observations also show more localities where injury has occurred, although the injury was less extensive at these localities than in 1929 or 1928. In 1928 there were only 5 areas of dense infestation whereas in 1930 there were 16 such areas surrounded and connected by an area where the beetles were abundant, which was in turn surrounded by a region varying in width where they were moderately abundant. The use of lead

arsenate in top-dressing lawns has helped to reduce the abundance of the beetles.

A new type of injury by *A. orientalis* was recorded in 1930, when the larvae were found feeding in a garden on roots of strawberry, maize, beans and rhubarb.

Fox (H.). **Recent Changes in Japanese Beetle larval Population in Philadelphia municipal Parks.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 212–217. Geneva, N.Y., February 1931.

The results of an annual survey of the soil population of *Popillia japonica*, Newm., carried out for four successive years in three squares covered with grass in the central metropolitan area of Philadelphia confirm previous indications that infestation tends to follow a definite sequence characterised by an initial rapid increase leading to a period of maximum abundance and followed by a decline. Two of the squares, owing to their proximity to the original source of infestation, became infested about a year in advance of the third, the westward advance of the beetle through the business part of the city being delayed owing to the scarcity of suitable breeding grounds. In 1930 the most recently attacked square was the most heavily infested, whereas infestation had died down in the other two, after having attained its maximum in 1928.

Hadley (C. H.) & Stockwell (C. W.). **Distribution of the Japanese Beetle** (*Popillia japonica* **Newm.**) **in the United States in 1930.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 217–218. Geneva, N.Y., February 1931.

A brief account is given of surveys made during the summer of 1930 to determine infestation by *Popillia japonica*, Newm., within the area hitherto designated as lightly infested and in contiguous territory, and of distant scouting in New Hampshire, Ohio, North and South Carolina and Georgia, the activities extending into 16 States in all. The extent of each previously discovered infestation was determined, and additional definitely established and slight infestations were located at numerous points both within and without the regulated areas. The infestation most remote from the site of the original infestation in New Jersey was in Pennsylvania, about 285 miles away.

Courtney (O. K.). **Trapping for the Japanese Beetle** (*Popillia japonica* **Newman**) **during the Seasons 1929 and 1930.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 219–226, 2 pls., 2 figs., 4 refs. Geneva, N.Y., February 1931.

The trap used against *Popillia japonica*, Newm., in New Jersey in 1929 and 1930 consisted of a pail, glass jar, funnel and bait container and cost about 3*s*. 6*d*. Crossed plates attached by welding to the top edge of the funnel act as baffles against which the beetles flying over the open pail strike and fall into the funnel and then down into the jar, where they can be easily seen [*cf. R.A.E.*, A, xvii, 421 ; xviii, 644]. This trap, which gives excellent protection to the bait in rainy weather, is suspended on an iron rod with 7 ins. of the upper end bent at a right angle, from the end of which the trap is hung on a hook. The rod is pushed into the ground so that the top of the trap is 3–4 ft. above ground

level. The bait used in 1930 consisted of 8 U.S. qts. geraniol, 28 oz. eugenol, 83 lb. bran, 7 U.S. qts. water, 21 U.S. qts. molasses and 7 U.S. pts. glycerine [*cf. loc. cit.*]. The method used for mixing it on a large scale is described. It was found that one man working 8 hours a day could attend to 250 traps. The numbers of beetles collected in localities where traps were placed both in 1929 and 1930 and in localities where traps were placed in 1930 only are shown in tables, and the percentage of beetles collected each week is shown in a chart, from which it appears that the largest collections were on an average a few days later in 1930 than in 1929. Approximately 17,563 traps were used in 1929 and 25,583 in 1930, the average cost for material and operation being about 7*s.* a trap, apart from the cost of the trap itself. The average cost of the bait alone was 7*d.*–8½*d.* a trap.

Gambrell (F. L.). **The Fruit Flies of New York.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 226–232, 1 pl., 2 figs., 5 refs. Geneva, N.Y., February 1931.

Trypetids of economic importance in New York State include *Rhagoletis fausta*, O.S., and *R. cingulata*, Lw. (cherry fruit-flies) ; *R. pomonella*, Walsh (apple maggot) ; *R. suavis*, Lw. (walnut husk maggot) and *Epochra canadensis*, Lw. (currant fruit-fly). Their economic importance and relative distribution and abundance in the State are discussed ; they are all either entirely or mainly monophagous, all single-brooded, and all susceptible in the adult stage to arsenicals, whereas they do not appear to be attracted to bait traps. These points are in striking contrast to such species as the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.] and the Mexican orange maggot [*Anastrepha ludens*, Lw.], which are polyphagous, multi-brooded and attracted to bait traps.

R. suavis attacks butternuts and black, English and Japanese walnuts, on which the larvae feed within the exocarp of the nut. The eggs are deposited during August beneath the surface of the husk, and number from a very few to one hundred or more in a single puncture, there being usually only one, but rarely two punctures to a nut. Larval feeding impairs the quality of the kernel and causes the exocarp to stick to the shell, which becomes blackened. Some early-infested nuts fall prematurely, whereas others remain on the trees long after the normal nuts have fallen from the husks to the ground. The injury caused is described in detail. The larvae leave the husks between 1st September and 1st November and pupate in the soil at a depth of ½–1½ ins., where they remain until the following summer. The flies emerge between 15th July and 15th August. Two applications of sulphur-lime dry-mix or lime-sulphur and lead arsenate, the first made 10–14 days after the initial emergence of the flies and the second 7–10 days later, have given upwards of 90 per cent. control. In the case of plantings at some distance from untreated trees, little difficulty should be encountered in securing satisfactory control.

Felt (E. P.) & Bromley (S. W.). **Insecticide Investigations during 1930.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 232–240. Geneva, N.Y., February 1931.

The following is the authors' abstract : Molasses nicotine soap sprays, which have proved effective in the control of *Pachypsylla celtidis-mamma*, Riley (hackberry leaf gall Psyllid), *P. celtidis-gemma*, Riley

(hackberry bud gall Psyllid), *Nepticula sericopeza*, Zell. (maple Nepticula) and *Paratetranychus bicolor*, Banks (oak red spider), were applied with safety to a series of 13 species of trees at a molasses dilution of 1 : 20. Tulip trees [*Liriodendron tulipifera*] and grey birch showed slight injury at this dilution. Owing to the dry seasons of the past two years, *Blissus leucopterus*, Say (chinch bug) became a serious lawn pest in certain localities. A series of sprays and dusts was tested for its control, with potassium oleate plus nicotine appearing the most promising. A series of sprays was tested for the control of *Stephanitis rhododendri*, Horv. (rhododendron lace bug), with results indicating the value of the spray when there was a thorough wetting of the insect. Dormant oil sprays were demonstrated as effectively controlling *Argyrotoxa semipurpurana*, Kf. (oak leaf-roller) by killing the over-wintering eggs. *Toumeyella liriodendri*, Gmel. (tulip tree scale) was effectively controlled by certain dormant oil sprays, but only partial controls were obtained after foliation had taken place and the scale had advanced in growth and resistance. Field tests with dormant oils on sugar maples and black walnut demonstrated the injurious effect of such sprays on these trees. Characteristic types of injury produced by the application to various types of tree of oil and lime-sulphur, and to conifers of combinations of soap and lead arsenate, are described.

STREETER (L. R.), CHAPMAN (P. J.) & PEARCE (G. W.). **Experiments in Spray Residue Removal.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 240–244, 1 ref. Geneva, N.Y., February 1931.

In view of the possibility of spray residue removal becoming necessary in New York State at some future time, preliminary tests of commercial methods for the removal of residues from apples were carried out to determine their effectiveness under the conditions prevailing there. It was found, rather unexpectedly, that methods meeting the needs of the Pacific Northwest were not entirely adaptable to the needs of the north-eastern States, where the problem is complicated by an excessive accumulation of sulphur residues, especially those from lime-sulphur, road and cement dust, and the deposit of excrement by *Typhlocyba pomaria*, McAtee. Whereas standard washing machines using hydrochloric acid as a solvent are entirely satisfactory for removing arsenical residues, a machine combining the washing and wiping principles is needed for the several types of residues encountered during these tests, and no single machine now on the market entirely meets these requirements. No method yet tried has been completely successful in removing leafhopper spotting.

JONES (H. A.) & DAVIDSON (W. M.). **Preparations containing Rotenone for Use as Insecticides. I. Aqueous Suspensions.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 244–257, 18 refs. Geneva, N.Y., February 1931.

The following is taken from the authors' summary and conclusions : Aqueous suspensions of rotenone were prepared by the addition of rotenone solutions in water-miscible solvents to water, and by the mixing of powdered preparations of rotenone with water. Numerous

solvents and protective colloids were tested. Permanent suspensions containing 0·05 to 0·5 gm. of rotenone per litre, and having rotenone in a highly dispersed condition, were obtained by the addition of pyridine solutions and of acetone solutions containing tannic acid to water. Mixtures of certain dry protective materials, such as the gums, saponin or bentonite, with precipitated rotenone also gave satisfactory suspensions when first made into a paste with water and then diluted to the desired concentration. Suspensions are more easily obtained in slightly alkaline than in acid media, but the former condition is not advisable owing to the sensitivity of rotenone to the action of the alkalis. It is difficult to obtain permanent suspensions in very hard water. The value of aqueous suspensions of rotenone in the control of certain types of insects has been previously demonstrated [*R.A.E.*, A, xix, 101]. Owing to the decomposition of rotenone in certain solvents [see next paper], it is advisable to prepare primary solutions immediately before making the finished suspension, or to make use of powdered preparations.

DAVIDSON (W. M.) & JONES (H. A.). **Change in Toxicity of Rotenone in Solution and Suspension.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 257–262, 5 refs. Geneva, N.Y., February 1931.

The following is taken mainly from the authors' abstract : Rotenone has been found to decompose at various rates when allowed to stand in solution in certain solvents, the decomposition being evidenced by development of a yellow colour and in some cases by separation of certain of the yellow decomposition materials in crystalline form. This change is accompanied by a loss in toxicity, as shown by tests made with aqueous suspensions prepared from these solutions against various insects. The loss in toxicity occurs most rapidly in pyridine, less rapidly in acetone containing tannic acid, and is imperceptible in acetone alone or alcohol. The yellow decomposition products separating from pyridine solutions were found to have much less insecticidal activity than pure rotenone. The aqueous solutions prepared from acetone and alcohol solutions of rotenone showed only a slight loss in toxicity on standing. Dry rotenone showed no decomposition or loss in toxicity.

CARTER (R. H.). **The Incompatibility of Lime with Fluosilicates.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 263–268, 1 graph. Geneva, N.Y., February 1931.

The following is the author's abstract : A discussion of the composition and chemical properties of the fluosilicates in relation to their insecticidal use and possible injury to foliage is presented. The effects of the addition of hydrated lime to sodium, potassium and barium fluosilicates in order to reduce their acidity in solution was studied in mixtures ranging in proportions from 1 to 20 parts of lime to 10 parts of fluosilicate. It was found that the addition of small amounts of lime materially decreased the solubility of the fluosilicates, probably owing to the introduction of a common ion from the reactions. Strongly alkaline solutions were formed when an excess of lime was present, owing to further reactions.

BADERTSCHER (A. E.). **The Effect of Soap on the Toxicity of a Pyrethrum Product known as "Red Arrow."**—*J. Econ. Ent.*, xxiv, no. 1, pp. 268–277, 3 figs., 4 refs. Geneva, N.Y., February 1931.

The samples of the commercial pyrethrum product used in this investigation that were manufactured in 1927, 1928 and 1929 consisted of 40 per cent. of a five-fold oleoresin of pyrethrum, 30 per cent. potassium coconut fatty acid soap, 5 per cent. alcohol and 25 per cent. water. In the 1930 sample 15 per cent. of the potassium coconut fatty acid soap was replaced with 15 per cent. sulphonated oleic acid. By the term five-fold oleoresin is meant that 1 lb. of the oleoresin is the material extracted from 5 lb. of flowers, which are the source of the toxic principle in this particular product. The additional soap used in the diluted spray material was in all cases a neutral potassium coconut fatty acid soap.

Studies were made of the toxicity of the product at varying concentrations; of the soap at varying concentrations; and of mixtures of the product with additional soap, with the product variable and the soap constant and with the soap variable and the product constant. The materials were tested in the laboratory under as nearly uniform conditions as possible against *Aphis spiraecola*, Patch. The results indicated that the product diluted with tap water does not function at its maximum efficiency, probably because the surface tension of the aqueous carrier is too high to permit sufficient penetration into the internal tissues of the Aphid through the breathing system. It is indicated, however, that the toxicity of the pyrethrum charge may be multiplied by 3·6 when diluted with water containing enough soap (0·4 per cent.) to condition the aqueous carrier to very nearly 30 dynes. Satisfactory control was obtained from spraying with a pyrethrum concentration of 0·02 per cent. oleoresins, obtained by a dilution of the product of 1 : 2,000 with a soap content adjusted to 0·4 per cent. concentration.

A study of the relative toxicity of samples of the product manufactured in 1927, 1928, 1929 and 1930 respectively, kept under normal storage conditions and tested in October 1930 on honey bees and *Aphis rumicis*, L., showed that the various samples tested lost very little if any of their toxicity [*cf. R.A.E.*, A, xviii, 486].

FILMER (R. S.). **Comparative Performance of Nicotine Tannate and Lead Arsenate against the Codling Moth.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 277–283, 2 refs. Geneva, N.Y., February 1931.

In view of the increased severity of regulations against spray residues and the consequent increasing importance of arsenical substitutes against the codling moth [*Cydia pomonella*, L.], further experiments were carried out in New Jersey in 1930 with nicotine tannate [*cf. R.A.E.*, A, xviii, 386]. As experiments in 1929 showed rather rapid disappearance of the nicotine tannate from the fruit and foliage, spray applications were made at 10-day intervals in order to maintain a more constant coating of the material. Tests were made on early and on late fruit from the 7-day spray onward with tank-mixed nicotine tannate (2 lb. tannic acid and 1 U.S. pt. 50 per cent. nicotine to 100 U.S. gals. spray material); and comparative tests with tank-mixed and powdered nicotine tannate (containing approximately 20 per cent. nicotine and applied at the rate of 2 lb. to 100 U.S. gals.) were made

on late fruit against the second brood of the moth, following first brood treatment with lead arsenate. Both forms of nicotine tannate were applied with 2 lb. skim milk as spreader and 6 lb. colloidal sulphur as a fungicide, and control plots received standard lead arsenate treatments.

The results showed that nicotine tannate controls *C. pomonella* as well as lead arsenate, provided that a sufficient coating is maintained upon the foliage during the period of moth activity. No injury was caused to fruit or foliage by the concentrations used. Analysis showed that considerably more of the tank-mixed form was deposited on the foliage, and a greater amount remained on the foliage between spray applications than of the powdered form. With both forms, however, there was a very rapid disappearance from the foliage, as much as 60–70 per cent. being lost within the 10-day period. There is therefore need for further study to improve the adhesive qualities of nicotine tannate before it can be classed as an efficient arsenical substitute.

Ginsburg (J. M.). **What Summer Oil Sprays may do to Apple Trees.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 283–290, 2 pls., 10 refs. Geneva, N.Y., February 1931.

Several highly refined petroleum oils, ranging in viscosities from 80 to 320 Saybolt/100, and sperm oil have been sprayed on apple and peach trees in New Jersey during the spring and summer months over a period of four years. The oils were emulsified with either soft soap or powdered skim milk and applied in concentrations of from 0·5 per cent. to 3 per cent. actual oil. Several blocks of apple trees were sprayed repeatedly during two successive seasons, and the cumulative effects of the oil on the foliage and fruit were studied. A comparison of the results secured clearly indicates that saturated petroleum oils, when applied to the foliage of apple trees, may bring about physiological changes in the growth processes and fruit production of the plant. The reaction of the plant to the oils varies according to the concentration of the oil, the nature of the plant, the condition of the tree and climatic factors. Petroleum oils cannot be sprayed, even in the minimum concentration necessary for insect control, unless they have been completely freed from unsaturated hydrocarbons, and even then the danger of foliage injury is not completely eliminated. Oil applied to apple trees during May and June, when the leaf tissue is soft and is growing rapidly, is apt to cause severe injury resulting in partial defoliation and drop, whereas the same oil applied during July and August, when new growth of foliage is slow and the new wood comparatively hardened, causes no injury. Peach trees can stand a higher dosage of oil (1 per cent.) in the early part of the season, and much more (2–3 per cent.) in the late part of the season than can apples. Sperm oil proved less injurious to peach and apple foliage than any other of the animal and vegetable oils tested.

The difference in the susceptibility of various trees to oil injury may be correlated with the penetration of the oil into leaf tissue. Petroleum oils generally penetrate the leaf tissue very rapidly through the under surfaces and only slowly through the upper surfaces of apple and peach foliage ; drops of oil applied to apple leaves remained on the upper surface for several days, but penetrated through the lower surface within one or two hours. Whereas all the petroleum oils of flowing consistency at room temperature will penetrate stomata of

growing leaves, the rate of penetration is inversely proportional to the viscosity of the oil. Soon after the oil has penetrated into the leaf, the tissue becomes translucent, turns brown and eventually dies. The rapidity with which the injury develops varies with the kind of oil, species of plant or climatic factors. Injury may be caused by interference with transpiration and respiratory activities, or the oil may exert some solvent action on the waxy materials present in the cuticle of the leaves, thereby allowing undue evaporation to take place.

HEADLEE (T. J.). **Performance of the Thermal Constant as an Indicator of the Time to apply Cover Sprays for Codling Moth.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 291–296, 3 refs. Geneva, N.Y., February 1931.

The following is the author's abstract: Through a period of three years, 1928, 1929 and 1930, the thermal constant [*R.A.E.*, A, xvii, 62] has been used [in New Jersey] for practical determination of the time when cover spraying should start for the first and for the second broods of codling moth [*Cydia pomonella*, L.] and has seemed to be eminently successful for that purpose. It seems likely that the thermal constant can be used as a satisfactory practical determinator of the length of periods during which spray coatings must be maintained on fruit and foliage against entry by larvae of the first and of the second broods. When the average weekly minimum temperatures reach about 60° F., pupation of summer larvae seems to cease, and it is thought that these minimum temperatures are probably the agency limiting the number of broods of *C. pomonella*.

PARROTT (P. J.), HARTZELL (F. Z.), GLASGOW (H.) & HARMAN (S. W.). **Hints at new Spray Procedures.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 297–302, 2 refs. Geneva, N.Y., February 1931.

Investigations have been carried out in New York State to determine the effect on certain pests of apple of autumn defoliation, autumn spraying and winter treatments. Autumn defoliation of apple trees, while failing to control the bud moth [*Eucosma ocellana*, Schiff.], had a noticeable influence on the rosy aphis [*Anuraphis roseus*, Bak.]. Of the defoliating materials tested, sodium nitrate (1 lb. per U.S. gallon) destroyed the leaves without any indication of injury to the twigs, and produced a marked reduction of Aphids on the trees in the following season. Autumn applications of sprays containing nicotine or ground tobacco to apple trees either when autumn migrants or when ovipositing females were present on the trees also reduced to an important extent the number of apple Aphids. Winter treatment with English tar distillate sprays proved very effective against eggs of the rosy apple aphis and nymphs of *Chermes* (*Adelges*) *abietis*, L., on spruce, but were ineffective against the leaf-roller [*Tortrix argyrospila*, Wlk.]. No injury to the trees was apparent. Applications of American "creosote oil" (a fraction of American crude tar oil boiling between 200° and 270° C.), emulsified with sulphonated castor oil and an alkali (usually sodium hydroxide), killed the eggs of *A. roseus* and apparently caused no serious injury. It was also found that the spray could be emulsified by using sulphonated fish-oils instead of castor oil, and these are considerably cheaper.

FROST (S. W.). **Some Habits of the Adults of the Oriental Fruit Moth with Reference to Baits.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 302–309, 3 figs., 1 ref. Geneva, N.Y., February 1931.

Further studies of *Cydia* (*Laspeyresia*) *molesta*, Busck [*R.A.E.*, A, xix, 92], dealing with the habits of the adults, were carried out in Pennsylvania in 1930. It was found that the best method of determining the moth population of a tree was to dust it with a 4 per cent. lime-nicotine dust during the hottest part of the day and catch the falling moths on a large white sheet beneath it. Bait traps tend to show a greater number of moths per tree than normally occur there, and counts of terminal injury may give a misleading indication, as a single larva may inhabit several twigs. Clipping infested terminals from every tree in a row through the centre of the orchard from north to south and from east to west showed infestation to be highest along the edges of the orchard. Studies of the abundance and distribution of moths determined by means of bait traps were carried out under almost identical conditions in 1928, 1929 and 1930. In 1930 the catches in June were large, and past records show that they were also large in 1925, but in the intervening years the catches were remarkably small in that month. In 1925 and 1930 the peak of the first summer brood came before the middle of June, whereas during the intervening years it came in July. It would appear that normal or sub-normal precipitation affects the catches of moths but little, and that other factors account for the variation in catches. Low catches during August, September and October 1930, however, were undoubtedly due to reduction of *C. molesta* because of unfavourable weather conditions.

Moths marked with a 0·5 per cent. solution of safranin in alcohol were released during August under two different sets of conditions (after a dry period and after rain) in an orchard equipped with 550 traps. The distribution of moths recovered from these traps indicate that they travel a considerable distance before settling down, none being found less than 3 trees from the point of release and some 15 trees to the south and 8 trees to the east. In both releases, moths taken on the second day were more remote from the point of release than those taken on the first. There is a tendency for the moths to move in a direction opposite to the prevailing wind.

ALLEN (H. W.). **The Mass Production of *Macrocentrus ancylivorus*, a Parasite of the Oriental Fruit Moth, and its Distribution from southern New Jersey.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 309–314, 1 map, 1 ref. Geneva, N.Y., February 1931.

In view of the successful establishment in New York in 1928 [*R.A.E.*, A, xviii, 407] of *Macrocentrus ancylivora*, Rohw., obtained from collections at Moorestown, New Jersey, the work of mass production and distribution of this parasite was continued there in 1929 and considerably extended in 1930, when adults were produced in large numbers and successfully shipped and liberated in 86 colonies in 13 States. Peach twigs infested with larvae of the oriental peach moth [*Cydia molesta*, Busck] and leaves of strawberry infested with the strawberry leaf-roller [*Ancylis comptana*, Fröhl.] were collected according to seasonal abundance. Trimmed twigs containing the larvae of *C. molesta* were placed in large cloth-bottomed trays with sufficient apples to allow the smaller larvae present to complete their develop-

ment after the twigs had become dry. Narrow strips of corrugated cardboard were tacked on the inner edge of the trays for cocooning larvae. The trays were stacked within large unit cages. The leaves containing the larvae of *A. comptana* were tied together in bunches of 50 and then arranged on chicken wire frames in shallow metal pans containing water so that the stems only were immersed. Adult parasites emerging were collected from the walls of the cage daily by means of an electric vacuum device used with a sliding rheostat to regulate the motor speed.

As *A. comptana*, the only other known host of *M. ancylivora*, is not abundant over much of the area infested by *C. molesta*, it appeared advisable to make liberations as early as possible when infested peach twigs were abundant, and to discontinue them when the infestation had passed into the fruit. Rearing of the host for experimental purposes was continued throughout the summer and large collections were made again in the autumn to obtain hibernating parasites for early spring liberations. The number of parasites obtained in the spring collections represented 22·4 per cent. of the total number of peach twigs, and 13·2 per cent. of the total number of *A. comptana* collected. Parasitism of *A. comptana* collected in autumn averaged 40 per cent. For transport, the adult parasites were confined in small cages of 300 cubic inches capacity up to a maximum of 500 to a cage. These cages were provided with water bottles and cloth separators to increase the resting area. Rather severe losses were sustained when the adults were shipped without food after being fed on honey-water solution before packing, but when food was provided this mortality was abruptly reduced. The unit shipping cages were packed in larger crates embedded in moist sphagnum. Shipments were made at daily intervals to assistants in the field. Preliminary recovery collections indicate positive recoveries from 23 out of 54 liberations tested.

GARMAN (P.). **Oriental Fruit Moth Parasite Work in Connecticut in 1930.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 315–316. Geneva, N.Y., February 1931.

A brief account is given of work begun in Connecticut in 1930 in the breeding and distribution of parasites of the oriental fruit moth [*Cydia molesta*, Busck]. A total of 9,500 adults of *Macrocentrus ancylivora*, Rohw., emerged from 35,000 infested peach twigs and 15,000 folded strawberry leaves collected in New Jersey [*cf.* preceding paper]. The collected material was shipped in cardboard cartons packed in moist sphagnum. A further consignment of 3,000 parasites was imported from New Jersey, and over 11,000 were successfully reared in Connecticut after the middle of July, 4,000 of which were kept in storage for use in 1931.

During the summer 4,000,000 *Trichogramma* were distributed to growers, and a further 2,000,000 were released experimentally, yet another 2,000,000 having been reared but not distributed. The cost of breeding *Trichogramma* in 1930 was estimated at 1*s.* per 1,000, not including apparatus, and *M. ancylivora* can be reared at 2*s.* per dozen, although the actual cost in 1930 was higher. Large numbers of *C. molesta* were reared in winter under greenhouse conditions, 12,000 eggs, from which 3,000 spun larvae were secured, being produced during February and March. Of 12–15 thousand larvae reared during the

summer 6–10 thousand were kept in storage. Twig collections in 14 orchards showed the presence of *M. ancylivora* in 8, including 6 in which the parasite had been released for the first time. No great increase of parasitism has occurred in any of the orchards, however, and the reduction in fruit injury observed may have been largely due to natural factors.

Daniel (D. M.). **Oriental Peach Moth Experiments.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 317–318. Geneva, N.Y., February 1931.

The following is the author's abstract: Results are given of the season's experiments with 20 insecticides to control the oriental peach moth [*Cydia molesta*, Busck]. Partial reduction of infestation was secured in all cases, summer oils, alone, giving the best results on the whole. Lime sprays were found undesirable owing to the residue they leave.

A report of the third season's work in colonising *Macrocentrus ancylivora*, Rohw., is included. The area previously colonised showed a parasitism of 54·54 per cent., a 390 per cent. increase over that of last year.

Driggers (B. F.). **Experiments with White Oil-Pyrethrum for the Control of the Oriental Peach Moth.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 319–325. Geneva, N.Y., February 1931.

The following is largely taken from the author's summary and discussion: Laboratory experiments with white oil-pyrethrum [*cf. R.A.E.*, A, xviii, 406] sprayed on new and old peach twigs showed that newly-hatched larvae of *Cydia* (*Laspeyresia*) *molesta*, Busck, are killed more easily when they crawl over sprayed new growth than sprayed old growth. The difference appeared to be due to the greater absorptive power of the old growth for oil. Field spraying tests in which oil containing pyrethrum extract equivalent to ¾ lb. flowers per U.S. gal. was used at 0·5 and 1 per cent. on a 5-day schedule against third-brood eggs and larvae showed a reduction in invisible fruit infestation of from 60 to 75. Visible fruit infestation, which was comparatively high at the time spraying operations were begun, was reduced much less, so that the combined visible and invisible injury gave a total reduction of the fruit infestation of from 30 to 70 per cent. as compared with an untreated block. The experiments were made under conditions of light and decreasing infestation, and it is thought that as the percentage of eggs not killed under conditions of heavy and growing infestation would involve a greatly increased number of actual larvae, enough of these might reach the fruit to produce a very high infestation. If egg parasites were working vigorously in the unsprayed but not in the sprayed trees, the actual percentage of hatched larvae in the unsprayed block might be no greater, if as great, as the actual percentage in the sprayed one.

These considerations indicate the need of a considerable reduction in the first and second broods in order that the stock of the insect in the third and later broods may be greatly reduced. Methods for reducing the early broods include propagation and encouragement of parasites, measures developed against the overwintering larvae, and the use of mechanical barriers, such as talc or lime, in the early season sprays.

Dusting seven times in July and August with fibrous talc treated with white oil-pyrethrum so as to make a 2 per cent. dust gave an approximate reduction of 50 per cent. in infested fruit, but the reduction by natural agencies in this orchard was so great that no artificial control was necessary, although 50 per cent. of the crop had been infested in 1929.

SHULL (W. E.) & WAKELAND (C.). **Tarnished Plant Bug Injury to Beans.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 326–327. Geneva, N.Y. February 1931.

Puncturing of beans, which was first definitely recorded in Idaho in 1916 and has been increasing in extent for several years, became so serious in 1929 in the south of the State as to cause a reduction in the grade of beans that were otherwise of first quality. A small hole appears in the seed coat, beneath which are large loose granules of starch, the area surrounding the hole turning a light brown colour. Studies in which cages were set up in the field for the segregation of individual species of insects collected from bean plants showed injury only in those containing *Lygus elisus*, Van D. Injury was, moreover, produced to a greater or less extent in every cage into which *L. elisus* had been introduced, and it was determined by extensive sweeping that this Capsid was abundant in bean fields at certain periods of the summer. Beans punctured with a needle, although they became discoloured, did not show the starch granules in the cotyledon beneath the point of incision. Injury was most prevalent on one variety of bean with thin-walled pods, whereas another variety having a thick-walled pod through most of its growth period showed practically no injury.

HOUGH (W. S.). **Removal of Leafhopper Specking from Apples.**—*J. Econ. Ent.*, xxiv, no. 1, p. 327. Geneva, N.Y., February 1931.

The only practical method of removing leafhopper specking of apples, which was very severe in parts of Virginia and is caused principally by *Typhlocyba pomaria*, McAtee, has been found to be washing the fruit in a commercial washer equipped with a towel drying unit. The action of the hydrochloric acid and water solutions soaked the specks sufficiently for the towels to remove them entirely, except for an occasional spot deep in the stem end. This method was less effective when no acid was used, and all types of washing apparatus without drying attachment, as well as all dry-cleaning equipment, proved ineffective. For most cases 1 gal. acid to 100 gals. wash solution was found to be sufficient. Although a slightly weaker solution proved inadequate with apples of a variety sent from New York for treatment, it is probable that a more satisfactory removal would have been obtained even in this case if as much as 2 gals. acid to 100 gals. had been used.

JONES (W. W.). **Tomato Vines injured by a Mirid** (*Engytatus geniculatus* **Reuter**).—*J. Econ. Ent.*, xxiv, no. 1, pp. 327–328. Geneva, N.Y., February 1931.

Injury to tomatos in Texas and Arizona, consisting of spotting and girdling of the stems, which caused brown discoloration and rendered them in many cases liable to break off, is believed to be due

to *Engytatus geniculatus*, Reut. The Capsids were abundant on the affected plants, being especially numerous at the tips of the stems, among the unfolding leaves and flower buds. Failure of tomatos to set fruit in Hawaii has been attributed to the presence of *E. geniculatus* on the flowers.

SNAPP (O. I.) & THOMSON (J. R.). **Tests with Paradichlorobenzene-Oil Emulsion against the San José Scale.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 328, 329. Geneva, N.Y., February 1931.

An experiment was conducted in Georgia to determine the effectiveness of a lubricating oil soap emulsion containing paradichlorobenzene when applied in January as a spray at strengths of 0·25, 0·5, 1 and 1·5 per cent. oil for the control of San José scale [*Aspidiotus perniciosus*, Comst.] on peach. Paradichlorobenzene was dissolved in the oil at the rate of 2 lb. to the U.S. gal. The results, which are shown in a table, indicate that the addition of paradichlorobenzene to the emulsion does not increase its effectiveness for scale control.

ROARK (R. C.). **Genuine Derris Root may contain no Rotenone.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 328, 330. Geneva, N.Y., February 1931.

Among numerous samples of derris roots recently examined, several have been found to be completely lacking in rotenone, which is undoubtedly their most valuable constituent [*R.A.E.*, A, xix, 101], though it has been suggested that all matter extracted from them by means of ether has some insecticidal value [*cf.* xviii, 376]. The chemical differences found may be due to a variation either of the species or variety of plant, or in the age of the roots or the conditions under which they were grown. The rotenone content of derris root has been found to range from 0 to 5·5 per cent., and the total ether extract from about 5 per cent. to 23 per cent., but there is no constant relation between the two. Not only does the total amount of toxic constituents in derris root vary greatly but the ratio of one constituent to another also varies. Two bales of derris root imported from Sumatra were found to be rich in toxicarol but entirely lacking in rotenone. This variability in derris roots must naturally be reflected in the extracts prepared from them, and the lack of uniformity in proprietary derris preparations accounts for many of the inconsistent results recorded by entomologists. Not more than 2 per cent. rotenone can be expected from the usual derris root now in the market. If producers are unwilling to supply derris root on the basis of a guaranteed rotenone content, consumers are likely to have recourse to the use of cubé root (*Lonchocarpus nicou*) from South America, which contains up to 7·6 per cent. rotenone and is just becoming commercially available. It is reported that an extract of cubé root prepared in Peru or Brazil is about to be placed on the American market.

LEONARD (M. D.) & SEIN, jr. (F.). **The Papaya Fruit Fly in Puerto Rico.**—*J. Econ. Ent.*, xxiv, no. 1, pp. 331–332. Geneva, N.Y., February 1931.

Permission to export papaya fruits from Porto Rico into the United States, applied for in the spring of 1930, has been withheld pending an

enquiry into the present status of *Toxotrypana curvicauda*, Gerst., recorded in 1913 as being abundant at Mayaguez [*R.A.E.*, A, i, 390]. A thorough survey of the Island with the exception of the eastern and south-eastern portion, made from 28th July till 2nd August 1930, failed to reveal any evidences of infestation, but early in September, 5 out of 30 fruits taken from trees in Lares, and 2 out of 8 fruits examined in the market at Mayaguez were found to contain larvae of *T. curvicauda*. A number of the localities previously surveyed were again visited between 25th and 27th September, but again no evidences of infestation were forthcoming. Three medium green infested fruits taken from Mayaguez market on 20th September were found to contain 3, 8 and 13 larvae respectively, all of which pupated in sand in a glass jar on 25th September. On 14th October 9 adults emerged and on 15th October a further 4, giving a pupal stage of 19–20 days, which corresponded with the pupal period of 7 adults reared at Lares.

NEWCOMER (E. J.). **A Substitute for Lead Arsenate.**—*Better Fruit*, xxv, no. 9, pp. 7–8. Portland, Ore., March 1931.

Experiments in Washington have shown that certain fluorine compounds are as effective as lead arsenate against the codling moth [*Cydia pomonella*, L.] on apples in the arid regions of the Pacific Northwest. Of three or four equally satisfactory compounds, barium fluosilicate and cryolite (sodium fluoaluminate) are available in a form suitable for use. Badly infested orchards were chosen for the tests. In 1928–29 44·6 per cent. of the fruit was injured and 24·1 actually infested after spraying with lead arsenate and 41·7 and 24·7 per cent. after spraying with cryolite. In 1930 in one case the figures were 16·8 and 10·4 after treatment with barium fluosilicate and 19·8 and 9·9 after lead arsenate, and in another case 18·2 and 11·2 and 18·6 and 10·2 respectively.

At present, the cost of these compounds averages slightly higher than that of lead arsenate. No injury that could be attributed to them was observed nor do they affect the colour, size or quality of the fruit. No standard of tolerance has yet been suggested for the residue from these materials. Fruit will undoubtedly require washing, but the residue is removed readily, particularly with alkaline washes.

It is suggested that growers wishing to try these compounds should include them in the second-brood sprays (5th and 6th cover) at the rate (to 100 U.S. gals. water) of 4 lb. with 1 pt. fish oil, or 3 lb. with 1 U.S. gal. summer oil emulsion. Lime in any form (*e.g.*, lime-sulphur, Bordeaux mixture or calcium caseinate) must not be used or poor control may result. The compound should be placed in the tank first and the oil added just before the tank is full. A spray programme is given, and its cost is discussed.

CROSBY (C. R.) & CHUPP (C.). **The Control of Diseases and Insects affecting Vegetable Crops.**—*Cornell Extens. Bull.*, no. 206, 99 pp., 11 figs. Ithaca, N.Y., N.Y. St. Coll. Agric., February 1931.

The authors have compiled in this bulletin a great deal of information on the practical control of the insects and diseases affecting the more important vegetable crops in New York State, including data obtained from unpublished notes of workers at the State Experiment Stations. The bionomics of the various insects dealt with are briefly reviewed.

Busck (A.). **Two new Peruvian Microlepidoptera of economic Importance (Gelechiidae and Oecophoridae).**—*Proc. Ent. Soc. Wash.*, xxxiii, no. 3, pp. 59–63, 1 pl. Washington, D.C., March 1931.

Gnorimoschema tuberosella, sp. n., infesting the stalks and tubers of potato, and *Eucleodora cocae*, sp. n., causing damage to the leaves of coca (*Erythroxylon coca*) amounting to about 60 per cent. of the harvest at the height of the season and about 20 in the winter, are described from Peru. The characters of the species of *Phthorimaea* and *Gnorimoschema* are briefly discussed, and it is concluded that the former genus is synonymous with the latter.

The Death-watch Beetle.—*Leafl. For. Prod. Res.*, no. 4, 5 pp., 3 figs. London, Dept. Sci. Ind. Res., January 1931.

The Anobiid, *Xestobium rufovillosum*, DeG., attacks large pieces of furniture, but its ravages are usually associated with roofing and flooring of old buildings. The eggs, which are deposited in crevices and old exit holes in the wood, hatch in 2–8 weeks, according to the temperature and humidity. The larvae pupate in the autumn after 1–2 years or more. The pupal period lasts 2–3 weeks, but emergence from the pupal chamber does not take place until the following April, May or June. The beetle confines its attention to old timbers and does not thrive in coniferous wood; of the hardwoods oak is chiefly attacked. The progress of infestation is slow and before any control is attempted, it should be determined that the insects are alive. Ventilation and sunlight should be increased in infested buildings. Remedial measures are briefly outlined [*cf.* *R.A.E.*, A, xvi, 186]. Treated timber should be inspected each spring. All wood used for repairs should be examined, sapwood being avoided for the purpose and treated timber utilised as far as possible.

Green (E. E.). **Observations on British Coccidae. XIII.**—*Ent. Mon. Mag.*, lxvii, no. 804, pp. 99–106, 3 figs. London, May 1931.

Notes are given on a number of Coccids and one new species is described. *Icerya purchasi*, Mask., was found, for the second time [*R.A.E.*, A, xiv, 595] in England, on *Acacia* sp. in a conservatory in Cheshire. The infestation was firmly established but was successfully eliminated. In view of the importance of dealing promptly with this pest if it occurs, the characters by which the various stages can be recognised are described. The means by which *Pseudococcus maritimus*, Ehrh., and *P. gahani*, Green, may be distinguished are given, both being recorded from various greenhouse plants. *Saissetia coffeae*, Wlk. (*Lecanium hemisphaericum*, Targ.) was found on cucumber in greenhouses in Wales, and *Chrysomphalus* (*Aspidiotus*) *ficus*, Ashm., which occurs frequently in glasshouses in England, on lemon fruits imported from Tripoli.

Menzel (R.). **Der Weidenbohrer als Obstbaumschädling.** [The Willow Borer as an Orchard Pest.]—*Schweiz. Z. Obst- u. Weinbau*, xl, no. 4, pp. 69–70, 2 figs. Wädenswil, 14th February 1931.

Cossus cossus, L., sometimes causes serious damage to fruit trees in Switzerland. Heavily infested trees should be felled and split up,

all larvae being destroyed. If only a few larvae occur, they may be killed by placing a wad of cottonwool soaked in carbon bisulphide or benzine in the mines and sealing them.

[Bukovskiĭ (V.).] **Буковский (В.). Data on the Fauna and Biology of Barkbeetles (Coleoptera Ipidae) of the Crimea.** [*In Russian.*] —*Bull. Soc. Nat. Amis Nat. Crimée*, xii, pp. 128–136, 5 refs. Simferopol, 1930. (With a Summary in German.)

This is a list of 31 species of Scolytids observed by the author in a forest area near Yalta in the summers of 1927 and 1928, with brief notes on their seasonal occurrence and local distribution and the trees attacked.

[Krishtal' (O. P.) & Petrukha (O. Ĭ.).] **Кришталь (О. П.) и Петруха (О. Й.). Pests of Field Crops in 1929.** [*In Ukrainian.*]—*Kiiv'ska kraĭova s.-g. dosl. Statz., Vidd. Ent.* [*Kiev Reg. Agric. Expt. Sta., Dept. Ent.*], no. 62, 52 pp., 9 figs., 1 ref. Kiev, 1930.

The first part of this paper deals with insect pests of field crops observed in the Kiev Government in 1929, with brief notes in some cases on their seasonal occurrence and the damage caused. The more important included : *Oscinella frit*, L., and *Cephus pygmaeus*, L., on cereals ; *Sitona crinita*, Hbst., *S. lineata*, L., and *Lygus pratensis*, L., on lucerne and sainfoin ; *S. sulcifrons*, Thnb., on clover ; *Contarinia medicaginis*, Kieff., and *Asphondylia miki*, Wachtl., on lucerne ; *Macrosiphum* (*Acyrthosiphon*) *pisi*, Kalt., on peas and vetch ; *Apion* (*Oxystoma*) *pomonae*, F., on vetch ; *Tychius quinquepunctatus*, L., *Cydia* (*Laspeyresia*) *dorsana*, F., *C.* (*L.*) *nigricana*, Steph., and *Bruchus pisorum*, L., on peas ; *Tanymecus palliatus*, F., and *Lethrus apterus*, Laxm., on soy beans ; *Pyrausta nubilalis*, Hb., on hemp ; *Meligethes aeneus*, F., and *Athalia colibri*, Christ (*spinarum*, F.) on crucifers ; and the larvae of *Melolontha melolontha*, L., on the roots of beet, and *Poeciloscytus cognatus*, Fieb, and the adults of *Cassida nebulosa*, L., and *C. nobilis*, L., on the leaves. *Agriotes sputator*, L., *A. gurgistanus*, Fald., and *Selatosomus latus*, F., caused considerable damage to winter wheat sown after leguminous crops ; and *Amphimallus solstitialis*, L., and *Anisoplia segetum*, Hbst., infested clover and potato fields. Adults of *Agrotis ypsilon*, Hfn., *Euxoa* (*Agrotis*) *segetum*, Schiff., *Feltia* (*Agrotis*) *exclamationis*, L., and *Polia suasa*, Schiff. (*dissimilis*, Knoch) were caught in numbers with molasses baits.

The second part of the report is devoted to the unusually severe outbreak of *Loxostege sticticalis*, L., in four districts of the Kiev Government in 1929. The seasonal occurrence of the adults and larvae and the damage caused in each district are discussed. On an average, the flight periods of the three generations were 25th–30th May, 11th–18th July and 17th August–10th September, respectively. The moths of the last generation were much more numerous than those of the two preceding ones, but the females were sterile and did not oviposit ; the authors believe this to be due to the heat and dryness that prevailed in August. In certain localities some of the females of the first and second generations did not lay eggs owing to the infestation of the ovaries by a fungus of the genus *Isaria* [*R.A.E.*, A, xvii, 144]. The severity of the damage caused varied in different districts ; the larvae infested a variety of

cultivated crops, and even deciduous trees, being especially abundant where weeds were present, especially *Chenopodium*. Parasitism among larvae of the first generation was negligible, whereas in some localities about 40 per cent. of the second were attacked by various Diptera and Hymenoptera, the prevalent species being *Zenillia* (*Tritochaeta*) *pullata*, Mg., and *Tachina larvarum*, L. The larvae were also destroyed by Carabids and insectivorous birds, particularly crows.

Spraying with 3–4 lb. lead arsenate or 1–2 lb. sodium arsenite to 120 gals. water proved effective in control. Four different types of dusting apparatus tested at the Entomological Station are described.

[Kolobova (A.).] **Колобова (A.). A Contribution to the Study of Pests of Lucerne.** [*In Ukrainian.*]—*Trud. Poltavsk. s.-g. dosvidn. Stantz.* [*Trans. Poltava Agric. Expt. Sta.*], no. 82, 15 pp., 10 figs., 2 refs. Poltava, 1929. [Recd. 1931.]

Brief notes are given on the more important pests of lucerne in the Government of Poltava, with a more detailed account of the bionomics of those that decrease the yield of seeds.

The overwintered adults of *Hypera* (*Phytonomus*) *variabilis*, Hbst., which has one generation a year, appear at the end of April and oviposit at the beginning of May, the eggs being laid in batches of 3–30 in cavities made in the stalks of lucerne. The young larvae feed on the closed terminal leaves and inflorescences, and readily migrate from plant to plant; the larval stage lasts about 18 days and the pupal 6–11, the larvae pupating in cocoons on the stems. The adults feed on the stems, but do not cause any appreciable damage; hibernation occurs on the soil under the fallen leaves.

The adults of *Apion filirostre*, Kby., feed on the leaves, and the larvae attack the flower buds. There is only one generation a year, the adults hibernating. The overwintered adults of *Tychius aureolus* var. *medicaginis*, Brisout, which also has one generation a year, deposit their eggs in the immature seed pods at the end of May, and the larvae, which hatch in ten days, cause galls, in which they feed for about 13 days. They then drop to the ground through an exit hole and pupate in the soil, the pupal stage lasting three weeks. The adults damage the stems and the ovaries of the buds and flowers. Similar galls on the seed pods are formed by the larvae of *Asphondylia miki*, Wachtl., which has several generations a year, hibernation occurring in the larval stage inside the galls. The larvae of *Contarinia medicaginis*, Kieff., which has three generations a year, produce galls on the flower buds. Hibernation occurs in the larval stage in the soil, and the adults emerge in May and oviposit in the flower buds. The eggs of *Bruchophagus gibbus*, Boh., are deposited through the seed pod on the soft seed, and the larvae eat the inside, pupating in the hollow shell. There are two or three generations a year, and the adults often emerge in the barns in which the lucerne is stored.

Experiments on possibility of control by mowing the lucerne at different dates were carried out in 1928, the relation between date of mowing and rate of infestation by *Hypera*, *Bruchophagus* and *Tychius* being shown in graphs. Lucerne of the first mowing was considerably more infested than the second crop, which should therefore be the one chosen for seed production. For this purpose, the date of the flowering of the second crop should be deferred by mowing between the 20th and 26th May.

[Rekach (V. N.).] **Рекач (В. Н.). Studies on the Biology and Control of the Melon-fly** *Carpomyia* (*Myiopardalis*) *caucasica* **Zaitz.** (? *M. pardalina* **Big.**).—*Bull. Azerbaijan Centr. Agric. Plant Breed. Expt. Sta.*, no. 9, 32 pp. 17 figs. Baku, 1930. [Recd. 1931.]

Some of this information on *Myiopardalis pardalina*, Big. (*Carpomyia caucasica*, Zaitz.) [*cf. R.A.E.*, A, xvii, 143], a serious pest of melons in Transcaucasia, which is the result of observations chiefly conducted during 1928, is similar to that already noticed [vii, 347 ; xvi, 294]. All stages of the fly are described. Three incomplete generations, which overlap considerably, occur in a year, the winter being passed in the pupal stage in the soil, at depths of from 2 to 15 cm. Of the first brood 26·7 and of the second 92·9 per cent. entered hibernation in 1928. Emergence of flies of the overwintered generation began on 11th June, at a soil temperature of about 20·5° C. [69° F.], and continued until 5th July, the peak being reached on 26th June. The average period between the emergence of one generation and that of the next is about a month. Oviposition begins a week after emergence and continues for about 3 weeks, each female laying at least 100 eggs. The flies feed on the juice exuding through punctures made in the skin of the fruit, etc. The process of oviposition is described. The eggs are laid in the pulp of the fruit under the rind, with a result that more or less noticeable swellings and spots are formed. The egg-stage varied from 2–3 days in summer to a maximum of 7 in autumn. The larval period lasted 8–18 days, and the pupal 13–20 or more. The larvae on hatching burrow into the fruit, where they feed on the seeds, juice and pulp. Besides melons, watermelons and *Ecballium elaterium* are attacked, but cucumbers are only infested when no other food-plants are present. The nature of the injury caused by the flies to various crops is discussed ; the annual loss to the melon crop in Azerbaijan alone is estimated at £12,500.

Injury can be prevented by placing paper covers, which should be changed twice during the growth of the fruit, on the flowers after they have been artificially fertilised. At the same time a number of fruits should be left as traps, with trays under them for the emerging larvae, which thus become exposed to their natural enemies. This method, however, is too expensive to be practical. Since the young fruits are more readily attacked, sowing as early as possible and the use of early maturing varieties are recommended. To prevent development of the larvae in the autumn, wild cucurbits and all fruit that is too late to ripen in time for harvest should be destroyed. The field should then be ploughed to expose the pupae to weather and natural enemies. Poultry allowed to run in a field where ploughing has been carried out aid considerably in control.

[Kosobutzkiĭ (M. I.).] **Кособуцкий (М. И.). Measures of Control of Cotton Pests in the Uzbek S.S.R. in 1930.** [*In Russian.*]—*Za Rekonstr. sel'sk. Khoz.* [*For the Reconstr. Agric.*], ii, no. 5–6, pp. 120–124. Samarkand, May–June 1930. [Recd. 1931.]

Notes are given on the distribution and economic importance of the following cotton pests in Uzbekistan, recorded under their popular names : *Tetranychus telarius*, L., *Aphis gossypii*, Glov., *Calliptamus italicus*, L., *Laphygma exigua*, Hb., *Euxoa segetum*, Schiff., and *Heliothis*

obsoleta, F. The programme of work against them in 1930 is briefly outlined, and the difficulties encountered in the organisation of control measures are discussed.

[NIKOLAEVSKIĬ (—).] **Николаевский (—). Air Methods for the Control of Agricultural Pests in Uz.S.S.R.** [*In Russian.*]—*Za Rekonstr. sel'sk. Khoz.* [*For the Reconstr. Agric.*], ii, no. 8–9, pp. 38–40. Tashkent, August–September 1930. [Recd. 1931.]

In view of the growth of cultivated areas in Central Asia and the difficulty of controlling locusts and grasshoppers, experiments which showed the possibility of broadcasting moist and dry poison baits from aeroplanes were carried out in the summer of 1930 in Uzbekistan. The average width of the swath obtained was about 81 ft.; with a side wind it was about 261 ft. with dry bait, and 135 ft. with moist. By flying at a height of about 330 ft., however, a swath 330 ft. wide was produced; this would be of value in dealing with an infestation over an extensive area. The use of aeroplanes is particularly applicable to desert regions and those where other methods of control are impossible. The economy in labour and time obtained is discussed.

CHEVALIER (A.). **Les déprédations des sauterelles en Afrique occidentale et la lutte anti-acridienne.**—*Rev. Bot. appl. Agric. trop.*, xi, nos. 115–116, pp. 145–159, 252–260, 1 pl., 7 refs. Paris, March–April 1931.

The hoppers of *Zonocerus variegatus*, L., which is met with throughout the coastal zone stretching from Senegal to the south of the Gulf of Guinea, have recently become injurious, and during the last two years have caused serious damage to coffee plantations in the forest zone of the Ivory Coast. They also attack cacao, banana, cassava and *Canna indica*. Control is effected by crushing, or by spraying with lead arsenate. When coffee is sprayed, it is advisable to add an adhesive prepared by soaking broken branches of *Cereus* in water for 24 hours.

Swarms of *Locusta migratoria migratorioides*, R. & F., have, since 1928, made their appearance throughout the whole of French West Africa. The dates of outbreaks since the French occupation are given, with an account of the present invasion in French Guinea, where the damage caused in 1930 was estimated at 40 per cent. of the cereal crop. Some biological observations are included. It is suggested that the permanent breeding-places are to be found at the edge of the Sahara and along the middle part of the Niger and the lower and middle portion of the Senegal rivers, and that the systematic deforestation of large areas has created vast savannahs suitable for the multiplication of the locust.

The hoppers attacked all low-growing plants, particularly Gramineae, and caused damage to young *Sorghum* and *Panicum exile*. The adults fed on various wild graminaceous plants, the crops most severely injured being *P. exile* and rice. Maize and *Sorghum* were seldom damaged, and cassava, *Colocasia*, *Xanthosoma*, leguminous plants, etc., were not attacked. Some damage was caused to banana, pineapple and cacao.

The usual control measures are discussed.

Frappa (C.). **Les insectes nuisibles au caféier à Madagascar.**—*Agric. prat. Pays chauds*, ii, no. 10, pp. 245–257, 7 figs. Paris, April 1931.

The Gryllid, *Brachytrypes membranaceus* var. *colosseatus*, Sauss., has been known in Madagascar for many years as a pest in the roots of coffee and *Albizzia lebbek*. To destroy it, calcium cyanide should be distributed through the underground galleries ; small heaps of leaves may be used as shelter traps. The Acridid, *Phymateus saxosus*, Coq., in the central regions of the Island destroys the young leaves of the new shoots of coffee ; in plantations the larvae and adults should be collected by children. Of the Coccids infesting coffee [*R.A.E.*, A, xviii, 508], *Saissetia coffeae*, Wlk. (*Lecanium hemisphaericum*, Targ.) is a minor pest. A Tingid, *Xenotingis* sp., occurs on the lower surface of the leaves, which turn yellow and drop. A 1 per cent. solution of methylene blue has been used with success as a spray ; a decoction of 5 lb. of dried tobacco leaves in 10 gals. of water might also be employed. Against the Scolytid, *Xyleborus coffeae*, Wurth [xvii, 193], a supplementary control measure is the use of fires of broken branches at evening, into which the beetles are attracted by the light. Lepidopterous pests are the Tineid leaf-miners, *Gracilaria coffeifoliella*, Motsch., and *Leucoptera* (*Cemiostoma*) *coffeella*, Guér., and the Pyralid, *Thliptoceras octoguttale*, Feld., which develops in the berries. Only the first of these is of any importance ; the infested leaves should be removed and burnt when the galleries are observed.

Escherich (K.). **Die Forstinsekten Mitteleuropas. Neuauflage von Judeich-Nitsche, Lehrbuch der mitteleuropäischen Forstinsektenkunde. Bd. III.** [The Forest Insects of Central Europe. (A new Edition of Judeich & Nitsche's Textbook of Central European Forest Entomology.) Vol. III.]—Med. 8vo, xi+825 pp., 605 figs., 14 pls. Berlin, Paul Parey, 1931. Price *M*.57.

In this volume, which follows the same lines as the preceding one [*R.A.E.*, A, xi, 517], six pages are devoted to the Panorpatae (Mecoptera) and Trichoptera, and the remainder to the Lepidoptera, exclusive of the Bombycids, Sphingids and butterflies, which are to be dealt with in the next and final volume. Some 120 pages comprise a general account of their classification, morphology and biology, the injury they cause, their larval diseases and control, together with a valuable bibliography of authors. The species of the various families are then considered under their systematic and economic aspects. Special attention has been paid to the illustrations, and the plates are in colour. The work reflects the new development of scientific investigation of the laws governing epidemiological phenomena as a basis for forest entomology.

Paillot (A.). **Les insectes nuisibles des vergers & de la vigne.**—Roy. 8vo, 366+vii pp., 242 figs. Paris, G. Doin & Cie, 1931. Price *Fr*. 8.75.

This book embodies the results of twelve years' observations at the Station of Agricultural Zoology of South-eastern France, and deals with the pests most common in the Rhône valley. The first part

gives a general account of control measures, including methods of preparing and applying insecticides and descriptions of various sprayers and dusters. The greater part of the volume deals with the various insect pests of orchards, about 20 pages being devoted to those attacking vines.

Trouvelot (B.). **Le laboratoire de campagne pour l'étude du Doryphora et premières études sur la dissémination naturelle du Doryphora dans le Poitou et le Limousin.**—*C.R. Acad. Agric. Fr.*, xvii, no. 10, pp. 339–345, 4 refs. Paris, 1931.

This is a further discussion of the spread of the potato beetle [*Leptinotarsa decemlineata*, Say] in France [*R.A.E.*, A, xix, 251] as observed by a new mobile field laboratory, showing that migration of the adults occurs throughout the summer. New centres of infestation can be easily stamped out provided that they are dealt with within a month of their formation, that is, before the first larvae descend into the earth (at the end of June), or at least before the insects in that colony become adult. When an infestation already covers several acres, however, it is a long and difficult task to exterminate it. As, in addition to the large migratory flights, which occur in hot summers when the beetles are numerous, there is the constant slow migration of a few miles at a time, a mobile field laboratory is considered the ideal method of dealing with the situations that arise. The installation and organisation of the work is briefly described.

Hodson (W. E. H.) & Beaumont (A.). **Seventh Annual Report of the Department of Plant Pathology for the Year ending September 30th 1930.**—*Pamph. Seale-Hayne Agric. Coll.*, no. 36, 36 pp. Newton Abbot, Devon, 1931.

Notes are given on the prevalence of a large variety of pests recorded during the year in Devonshire and Cornwall. Among them were *Bruchus rufimanus*, Boh. (bean beetle), which in some cases damaged 50 per cent. of field beans ; *Sitona lineata*, L. (bean weevil) on soy beans ; *Trama troglodytes*, Heyd. (root aphis) on lettuce ; the leaf-eating weevil, *Phyllobius maculicornis*, Germ., on pears ; the Tenthredinid, *Priophorus* (*Cladius*) *brullei*, Dhlb., on loganberries ; and the Tettigoniid, *Leptophyes punctatissima*, Bosc, on apple stocks.

Tarsonemus fragariae, Zimm. (strawberry mite) [*cf. R.A.E.*, A, xviii, 521 ; xix, 177] is universally abundant in strawberry plantations. Strong-growing continental varieties do not show symptoms of attack to any extent, nor harbour large colonies of mites. Between mid-October and mid-January, the mites are scarce and many undamaged leaves may be produced in late autumn. Preliminary experiments suggest that considerable benefit may be obtained by immersing strawberry runners in water maintained at 110° F. for 20 or 30 minutes ; only about 5 per cent. of the plants were killed by this treatment, and the others grew vigorously and were free from mites.

Otiorrhynchus sulcatus, F. (vine weevil), which is a pest of many pot plants, has been studied during the last four years. There is only one generation annually, but the weevils, all of which are females capable of laying fertile eggs, normally live for two seasons, during both of which oviposition takes place, up to 500 eggs being laid. The

egg-laying season extends from February to October. The eggs are deposited in batches of 5 to 12. From 5 to 50 eggs may be placed in the top soil of each pot, and the larvae feed on the underground parts of the plant, overwintering in the soil and then pupating. The adults emerge in May or, if the pots are in a heated glasshouse during the winter, in January. In the case of cyclamen, the young larvae sometimes mine those leaves that touch the soil for 10–14 days before entering the soil. In greenhouses the adults should be collected each morning from traps of hydrangea leaves placed under boards or pieces of old sacking. Experiments indicate that all potting soil used for susceptible plants might be poisoned by incorporating 4 oz. Paris green with each bushel; sometimes, however, plants with fleshy roots are somewhat checked when very young by this treatment.

Reference is made to the bait sprays found successful against *Merodon equestris*, F., and *Eumerus tuberculatus*, Rond., which are important pests of narcissus bulbs [see next paper].

A list is given of insects not recorded in the six preceding years or occurring on food-plants not previously recorded. They include *Agriotes obscurus*, L., on grassland, from the larvae of which the Proctotrupid, *Paracodrus apterogynus*, Hal., was bred; and *Hypera* (*Phytonomus*) *polygoni*, L., on barley, from the pupae of which the Eulophid, *Necremnus leucarthros*, Thoms., and the Ichneumonid, *Hemiteles albomarginatus*, Bridgm., were obtained in numbers.

Hodson (W. E. H.). **A new Method of preventing Attacks of Bulb Flies on Narcissus.**—*J. Minist. Agric.*, xxxviii, no. 1, pp. 54–60, 1 ref. London, April 1931.

A brief account is given of the life-history of *Merodon equestris*, F. [*cf.* *R.A.E.*, A, xvi, 107], which has one generation a year, the adults ovipositing between mid-May and the end of June in south-western England, and *Eumerus tuberculatus*, Rond., and *E. strigatus*, Fall. [xv, 460], which are very serious pests of narcissus bulbs. Many factors limit the success of cultural control measures [*cf.* xvi, 272], and in preliminary experiments with deterrents, paraffin emulsion sprays applied to the foliage only kept the flies away for 3 days, and crude naphthalene broadcast on the soil also had only a temporary effect. As flies in the insectary fed freely on a white sugar solution, brown sugars and crude molasses proving less attractive, a bait spray of white sugar and sodium arsenite was tested. It was found to dry rapidly and was only effective for 2 days. When crude glycerine was added, however, it held the bait to any surface on which it was sprayed and kept it slightly moist for a considerable time by absorbing moisture from the air. Field tests with this spray were carried out in 1929, the formula used being 4 oz. sodium arsenite, 1 lb. crude glycerine, 2 lb. white sugar and 4 gals. water. Counts of the larvae at lifting time to determine how the population compared with the normal one for the season and district indicated that the infestation had been materially reduced by the spray.

Insectary tests with poisoned and unpoisoned baits, however, showed that the sodium arsenite acted as a slight deterrent. Though the majority of various fluorides and silicofluorides tried had a definitely deterrent effect on the flies, small quantities of sodium fluoride were apparently unnoticed by them, and it was therefore substituted for the sodium arsenite in the formula given above for experiments in 1930.

The flies take the bait freely, and when it is fresh, death results in 1–5 hours, though after it has been exposed to the air for 10 days, up to 48 hours may be required. In the field, where very promising results were obtained, it appeared to remain toxic to *E. tuberculatus* for 3–14 days and to *M. equestris* for 3–10, depending on the weather conditions. It would probably remain effective for a considerable time in the absence of heavy rain, for in the insectary it killed flies after nearly three months. A total of 8 gals. of the spray, which should be widely distributed in the form of large drops, is sufficient for an acre, the cost being about 6*d*. a gallon. A minimum of four applications should be made—in the last week of May, in mid-June and mid-July, and the last, against *Eumerus*, in the third week of August. Sunny, sheltered situations, where most flies are found, should be sprayed in particular. A warm, bright day should be chosen, as it is essential for the flies to be on the wing.

HOOPER (C. H.). **Fruit Pollination and the Importance of Insect Visitors in Fruit Production.**—*Bee Wld.*, xii, nos. 3–4, pp. 27–28, 37–39. Camberley, Surrey, March–April 1931.

An account is given of the importance of insects in fruit pollination [*R.A.E.*, A, xvii, 496], with brief notes on the insects observed on fruit blossoms by the author and by G. Fox Wilson in Britain and on the organised employment of hive bees in this connection.

WILSON (G. F.). **Biological Control of the Greenhouse White Fly.**—*Gdnrs'. Chron.*, 1931, pp. 15–17, 4 figs., 3 refs. London, 3rd January 1931.

Notes are given on the bionomics of the Chalcid, *Encarsia formosa*, Gah., and its utilisation against *Trialeurodes vaporariorum*, Westw., in greenhouses in Britain [*R.A.E.*, A, xvii, 257, 406, etc.]. The adult is briefly described. Plants that are distasteful to the parasite and a number that are not repellent are enumerated. Both *E. formosa* and *E. partenopea*, Masi [*cf.* xvii, 499] attack only the immature stages of *T. vaporariorum*, so that when the whitefly is exterminated they die from lack of food. *E. formosa* is the more satisfactory, for *E. partenopea*, although hardier, takes longer to become established. The parasite is sent out in parasitised scales on the foliage of tomato and other greenhouse plants. This foliage should be tied up in bundles and hung from the wires of houses near the infested plants, and left for at least three weeks in order to obtain the maximum emergence of the adults. The parasite remains active in houses where the temperature does not fall below 50° F., but is very sluggish at low temperatures.

WILSON (G. F.). **Insect Pests of hardy Rhododendrons: with Notes on some uncommon Damage.**—*Gdnrs'. Chron.*, 1931, pp. 244–245, 3 figs., 8 refs. London, 28th March 1931.

In addition to pests of rhododendrons previously recorded in England [*R.A.E.*, A, xiii, 107], notes are given on the Noctuids, *Calymnia* (*Caradrina*) *trapezina*, L., *Brotolomia* (*Hadena*) *meticulosa*, L., *Monima incerta*, Hfn., and *Eustrotia uncula*, Clerck; the Geometrids, *Anisopteryx* (*Erannis*) *aescularia*, Schiff., and *Phigalia* (*Apocheima*) *ped-*

aria, F.; the Tortricids, *Tortrix* (*Cacoecia*) *xylosteana*, L., *T.* (*Pandemis*) *ribeana*, Hb., and *Batodes angustiorana*, Haw.; the weevil, *Strophosomus coryli*, F.; *Megachile* sp. (? *maritima*, Kby.); and *Dialeurodes chittendeni*, Laing.

Box (H. E.). **The Crambine Genera** *Diatraea* **and** *Xanthopherne* **(Lep., Pyral.).**—*Bull. Ent. Res.*, xxii, pt. 1, pp. 1–50, 5 pls., 5 figs. London, March 1931.

In this revision of the American species of *Diatraea*, the genera *Iesta* and *Trinidadia*, recognised by Dyar & Heinrich [*R.A.E.*, A, xvi, 33], are considered to be synonyms. A key is given to the 48 species under consideration. Ten new species and the previously unknown males of three species are described. New synonyms are *Diatraea crambidoides*, Grote (*zeacolella*, Dyar) [*cf.* xvi, 34], *D. saccharalis*, F. (*incomparella*, Dyar & Heinr.) and *D. impersonatella*, Wlk. (*moorella*, Dyar & Heinr.). *D. impersonatella* was previously considered to be a synonym of *D. lineolata*, Wlk. In the literature the name *D. lineolata* has been applied, apparently indiscriminately, to sugar-cane and maize borers in the United States, Mexico, Cuba, Trinidad and British Guiana. The reference to *D. lineolata* in Cuba [xiv, 542], where it feeds on sugar-cane and maize, is undoubtedly correct, but the species attacking maize in the south-western United States is *D. grandiosella*, Dyar, and that recorded on sugar-cane in Trinidad and British Guiana is *D. impersonatella*. With regard to Mexico it is not improbable that the species recorded as a serious pest of sugar-cane in Sinaloa [xiv, 540] is *D. magnifactella*, Dyar, or *D. grandiosella*. The reference to *D. canella*, Hmps., on sugar-cane in the same paper is undoubtedly an error, and the species referred to is most probably *D. magnifactella*. *D. busckella*, Dyar & Heinr., hitherto known only from Panama, is recorded from Colombia and appears to be widely distributed in Venezuela wherever sugar is grown; in certain localities it is the predominant species, even where *D. saccharalis* and *D. canella* are also present.

A key is given to the genus *Xanthopherne*, with notes on the four species, two of which are new. Nothing is known of their bionomics.

Hodson (W. E. H.). **A Comparison of the immature Stages of** *Eumerus tuberculatus*, **Rond., and** *Syritta pipiens*, **Linn. (Syrphidae).**—*Bull. Ent. Res.*, xxii, pt. 1, pp. 55–58, 3 figs, 4 refs. London, March, 1931.

In the course of experimental work on *Eumerus tuberculatus*, Rond., and *E. strigatus*, Fall., in England [*R.A.E.*, A, xv, 460], *Syritta pipiens*, L., which bears a superficial resemblance to these Syrphids, was frequently bred from decayed narcissus bulbs. Its association with *E. tuberculatus* suggested that the larvae might also feed on bulbs, but repeated attempts to induce them to feed on healthy plant tissues were unsuccessful, and the bulbs infested by them were always exceedingly decayed. The larvae were also obtained from farmyard manure and heaps of vegetable refuse and tulip bulbs. It therefore seems probable that they are only scavengers and of little or no economic importance, but as they are frequently confused with those of *E. tuberculatus*, the larva and pupa of both these species are described.

Wilkinson (D. S.). **Braconidae : Notes and new Species.**—*Bull. Ent. Res.*, xxii, pt. 1, pp. 75–82. London, March 1931.

The species dealt with include : *Apanteles plutellae*, sp. n., from *Plutella maculipennis*, Curt., in Java ; *A. picipes*, Bch., previously recorded from *Phlyctaenia* (*Pionea*) *forficalis*, L., now bred from *Pyrausta nubilalis*, Hb., in France ; *A. xanthostigmus* var. *anarsiae*, Faure & Alab., which is raised to specific rank and re-described [*cf.* *R.A.E.*, A, xiii, 156], bred from the Tineid, *Anarsia lineatella*, Zell., in France and Italy, and the Tortricid, *Cydia molesta*, Busck, in France ; *A. talicida*, sp. n., from the Hesperiid, *Talides sergestus*, Cram., on *Heliconia* (wild plantain) in British Guiana ; *A. aethiopicus*, sp. n., which occurs in Uganda and Sierra Leone and has been bred from the Arctiid, *Utetheisa pulchella*, L., and the Pyralid, *Antigastra catalaunalis*, Dup., in Italian Somaliland ; and *Microgaster vacillatrix*, Wlkn. [described from Uganda in a paper already noticed (xviii, 635)], the host of which has now been determined as the Pyralid, *Filodes costiventralis*, Guen.

d'Emmerez de Charmoy (D.). *Phytalus* (**Col., Melol.**) **in Sugar-cane in Mauritius.**—*Bull. Ent. Res.*, xxii, pt. 1, pp. 83–87, 1 fig., 6 refs. London, March 1931.

The present situation in Mauritius with regard to infestation of sugar-cane by *Lachnosterna* (*Phytalus*) *smithi*, Arrow, and the various measures undertaken for its control are reviewed. Although it exists in 46,000 acres out of 170,000 planted with cane, the area of appreciable damage is restricted to about 3,200 acres, a situation that has been brought about by the control measures adopted. The reduction in yield in the heavily infested area may average 4 tons of cane per acre, but infested fields are frequently seen that still give an adequate yield, mainly owing to good cultural methods combined with a systematic control of the pest. The parasite, *Tiphia parallela*, Smith, appears to have become completely established, the rate of parasitism, which averages 20 per cent., with a maximum of 30 and a minimum of 7, being similar to that in Barbados, from which country it was originally introduced. A second Scoliid, *Campsomeris* (*Elis*) *thoracica*, F. [*R.A.E.*, A, vi, 301], has established itself on *L. smithi* [xviii, 141] and is now found in most of the infested cane fields. Its eggs are attached to the abdomen of the larvae, and it does not therefore interfere with the work of *T. parallela*, the eggs of which are laid on the thorax.

Ferrière (C.). **Notes on African Chalcidoidea.**—*Bull. Ent. Res.*, xxii, pt. 1, pp. 127–135, 3 figs. London, March 1931.

The new forms described are the Eurytomids, *Eurytoma verbena*, bred with larvae of *Platyedra gossypiella*, Saund., in Italian Somaliland, and *E. syleptae*, from the larva of *Sylepta derogata*, F., in Sierra Leone ; the Pteromalid, *Neocatolaccus sphenopterae*, from *Sphenoptera gossypii*, Cotes, in the Anglo-Egyptian Sudan ; the Elasmids, *Elasmus leucopterae*, from *Leucoptera coffeella*, Guér., in Tanganyika Territory, *E. flaviceps*, a hyperparasite of *Sylepta derogata* in the Anglo-Egyptian Sudan, and *E. masii* var. *natalensis*, from the pupa of *Apanteles diparopsidis*, Lyle, a parasite of *Diparopsis castanea*, Hmps., in Natal ; and the Eulophids, *Euderus gossypii*, from larvae of *Sphenoptera gossypii* in the Anglo-Egyptian Sudan and the Punjab, and *Apros-*

tocetus roseveari and the Encyrtid, *Psyllaephagus phytolymae*, both from the Psyllid, *Phytolyma lata*, Scott, on *Chlorophora excelsa* in Nigeria.

The genera *Secodella* and *Allomphale* are considered to be synonyms of *Euderus*. A Eulophid reared from *Selenothrips* (*Heliothrips*) *rubrocinctus*, Giard, in the Gold Coast has been determined as *Dasyscapus parvipennis*, Gahan, which was described from Java as a parasite or hyperparasite of *Thrips tabaci*, Lind. [*R.A.E.*, A, xv, 395].

Thompson (W. R.). **On the Reproduction of Organisms with overlapping Generations. (With an Appendix by H. E. Soper.)**—*Bull. Ent. Res.*, xxii, pt. 1, pp. 147–172, 6 figs., 1 ref. London, March 1931.

In many organisms, such as Aphids, the offspring begin to produce young before the parent has ceased to reproduce. The rapidity of the reproductive process renders such organisms eminently suitable for biological studies ; but the overlapping of the generations makes the calculation of the daily births laborious and complicated. In this paper mathematical formulae are developed that permit the daily birth-rate, total daily population, total births to date, etc., to be calculated without difficulty, when the average length of the pre-reproductive and reproductive periods and the numbers of young produced daily by the average individual are known.

Imms (A. D.). **Biological Control. I. Insect Pests.**—*Trop. Agriculture*, viii, no. 4, pp. 98–102. Trinidad, April 1931.

The control of insect pests by biological methods is discussed, with reference to the introduction of specific parasites or predators under insular and continental conditions, and the utilisation of indigenous ones, which is largely concerned with efforts to modify a condition of equilibrium already highly adjusted. Numerous examples of successful control are given. Accumulated experience has shown that the basic principles of biological control are essentially sound, but it is pointed out that success is largely dependent on expert knowledge, special equipment and special methods.

Dingler (M.). **Die Griesheimer Heuschreckenplage.** [The Outbreak of Grasshoppers at Griesheim.]—*Anz. Schädlingsk.*, vii, nos. 1–2, pp. 1–8, 18–20, 9 figs., 8 refs. Berlin, January–February 1931.

An outbreak of grasshoppers, almost exclusively *Calliptamus* (*Caloptenus*) *italicus*, L., occurred in June 1930 on the parade ground at Griesheim, Hessen. The insects spread to adjacent fields, defoliating the potato and vegetable crops there. The outbreak was due to the very hot and dry weather in June combined with the fact that the parade ground was disused. The measures advised are stamping and harrowing or ploughing the ground and keeping sheep on it.

Börner (C.). **Mitteilungen über Blattläuse.** [Communications on Aphids.]—*Anz. Schädlingsk.*, vii, no. 1, pp. 8–11. Berlin, January 1931.

Under this title short communications on Aphids will be published from time to time with a view to their future reproduction in more

detailed form. *Dysaphis*, gen. n., with *Aphis angelicae*, Koch, as type is distinguished from *Anuraphis*. *Yezabura marchali*, sp. n., is briefly described from *Prunus mahaleb* in Tyrol. *Aphis heraclei*, Koch, is considered a synonym of *Anuraphis* (*Aphis*) *subterranea*, Wlk. *Appelia schwarzi*, n. n., is proposed for *Anuraphis* (*Aphis*) *persicae*, Boy. (*amygdali*, Buckt.) as these names are preoccupied respectively by *Myzus* (*Myzodes*) *persicae*, Sulz. (which was described in *Aphis*) and *Aphis amygdali*, Blanchard, which is a synonym of *Hyalopterus arundinis*, F. (*pruni*, F.). *Appelia schwarzi* is confined to peach. In Central Germany the May shoots of pear are sometimes injured by a small brown-black Aphid, which is here briefly described as *Pyraphis streili*, gen. et sp. n. The grass-infesting species of *Toxoptera* are placed in a new genus, *Schizaphis*, with *graminum*, Rond., which the author had previously placed in *Rhopalosiphum*, as the type. *Amphorophora cosmopolitana*, Mason [*R.A.E.*, A, xiii, 621] is considered to be the true *Aphis lactucae*, L., which is referred to the genus *Rhopalosiphoninus*. *Macrosiphum lactucarium*, sp. n., is described from *Lactuca* spp. in Central Europe.

WICHMAUD (H.). *Hylotrupes bajulus* **L. in Dänemark.**—*Anz. Schädlingsk.*, vii, no. 2, pp. 13–16, 2 figs. Berlin, February 1931.

The Cerambycid, *Hylotrupes bajulus*, L., known in Denmark since 1763, has become a serious pest in buildings there [*R.A.E.*, A, xvi, 180, 594, etc.] during the past thirty years, owing, it is believed, to the use of slates for roofing. Prior to 1875 all houses were roofed with straw, wood or burnt tiles, all poor conductors of heat, and, with the last two, attics were sufficiently moist to prevent the timber from developing cracks. With slates, the attics become very hot in summer, and this shortens the larval period of *H. bajulus*, which also finds the cracks very suitable for oviposition. The coldness of slate-covered attics in winter does not affect the larvae. Infestation develops quickly under a slate roof and new breeding-places are constantly sought, whereas there are tiled houses in which *H. bajulus* has been present for a hundred years, and only a little of the timber has required replacing. A large industry has sprung up in Denmark to provide materials for destroying the pest and preventing infestation by it. Fumigation with hydrocyanic acid gas does not destroy all the larvae, but heat, applied by means of the plant used for drying out newly erected buildings, is stated to be satisfactory. In actual practice the attic is heated to 60–70° C. [140–158° F.] from 8 a.m. to 10 p.m., and in no case has it been possible to find any living larvae after this treatment.

REICHERT (A.). **Rosenschädlinge.** [Rose Pests.]—*Die kranke Pflanze*, viii, no. 2, pp. 19–22, 1 pl. Dresden, February 1931.

The larvae of the Tenthredinids, *Ardis bipunctata*, Kl. (*brunniventris*, Htg.) and *Monophadnus elongatulus*, Kl., are common pests of roses near Leipzig, feeding on the leaves and boring in the terminal shoots. *A. bipunctata* appears early in May, sometimes in April, and *M. elongatulus* a little later. The larvae are full-grown in a few weeks and spin a cocoon in the ground, but do not pupate until the following spring, shortly before the emergence of the adults.

Langenbuch (R.) & Schewket (N.). **Zur Lebensgeschichte des Moosknopfkäfers** (*Atomaria linearis* **Steph.**). [On the Bionomics of *A. linearis*.]—*NachrBl. deuts. PflSchDienst*, xi, no. 3, pp. 17–19, 5 figs., 7 refs. Berlin, March 1931.

An outbreak of *Atomaria linearis*, Steph., occurred on sugar-beet seedlings near Aschersleben, Germany, in the spring and summer of 1930 in an area that adjoined a potato field where beet had been grown in the preceding year ; it was absent in areas next to wheat that had followed a cereal. The foliage was attacked as well as the roots, but as dry weather was prolonged, the leaves were abandoned and the roots were injured deeper and deeper. In the laboratory the beetles died when the humidity of the air fell below a certain degree, and it seems probable that the migration from the leaves occurs when they become incapable of supplying sufficient moisture. The beetles nearly always feed in groups ; this enables the wound to be deepened quickly, and the beetles themselves form a cover preventing it from drying. *A. linearis* has hitherto been recorded from beet only, but field and laboratory observations showed that it also infests spinach, radish, and marjoram, as well as *Chenopodium album*, *Stellaria media*, and *Polygonum aviculare*. It probably has other food-plants.

Experiments showed that the beetles are but little susceptible to sodium fluoride or arsenical compounds, nor did treatment of beet-seed with naphthalene prove of any value, spraying with nicotine being the only measure of any use.

Frydrychewicz (J.). **Kiefernspannerstudien.** [Pine Moth Studies.]—*Z. PflKrankh.*, xli, no. 3, pp. 97–107, 2 figs., 4 refs. Stuttgart, March 1931.

These studies on the feeding habits of larvae of the pine moth [*Bupalus piniarius*, L.] are on the same lines as those on *Lymantria monacha*, L. [*R.A.E.*, A, xviii, 180].

Ripper (W.). **Eine unbeachtete Champignonmilbe :** *Linopodes motatorius* **L.** [An unnoticed Mushroom Mite, *L. motatorius*.]—*Z. PflKrankh.*, xli, no. 3, pp. 127–131, 2 figs., 7 refs. Stuttgart, March 1931.

In the autumns of 1928 and 1929, outbreaks of a mite occurred in mushroom beds near Vienna, which has been identified by A. C. Oudemans as the Eupodid, *Linopodes motatorius*, L. (*antennaepes*, Banks) [*cf.* *R.A.E.*, A, xviii, 349, 684]. The infested mushrooms failed to attain marketable size, *Coprinus atramentarius* being attacked as well as *Agaricus campestris*. The measures recommended include the use of buildings that are easy to clean ; sterilisation of the compost, by digging in the surface layers to a depth where the heat is fatal to the mite [*cf.* xviii, 685] ; and fumigation to kill any that attempt to escape when the compost becomes heated. The Oribatid, *Dameosoma nitens*, Koch, is also abundant near Vienna, and feeds on mushrooms, but does not cause any noticeable injury.

Erni (W.). **Beobachtungen über die Bekämpfung von Krankheiten und Schädlingen an Obstbäumen im Jahre 1930.** [Observations on the Control of Diseases and Pests of Fruit-trees in 1930.]—*Schweiz. Z. Obst- u. Weinb.*, xl, no. 5–6, pp. 83–87. Wädenswil, 4th March 1931.

Observations in Switzerland have shown that when the winter moth [*Cheimatobia brumata*, L.] is likely to be abundant (as indicated by the numbers caught on adhesive bands placed on the trees in the autumn), two applications, just before and just after blossoming, of a mixture of 2 per cent. lime-sulphur and 4 per cent. calcium arsenate or 2 per cent. lead arsenate give satisfactory control. If only one application is possible, it should be made just before blossoming. For combating the codling moth [*Cydia pomonella*, L.] on apple, two applications of the above sprays, one just after blossoming and the other three weeks later, are quite effective.

Menzel (R.). **Ergebnisse von Versuchen zur Bekämpfung des Frostspanners mit verschiedenen Mitteln.** [Results of Experiments in combating the Winter Moth with various Materials.]—*Schweiz. Z. Obst- u. Weinb.*, xl, no. 5–6, pp. 116–117. Wädenswil, 4th March 1931.

Adhesive bands are effective against the winter moth [*Cheimatobia brumata*, L.] in Switzerland if applied by mid-October at the latest, and are especially valuable where spring spraying has not been possible. The eggs laid below the bands are best destroyed by an 8–10 per cent. wash of fruit-tree carbolineum.

Menzel (R.). **Beobachtungen über das diesjährige Verhalten des Blutlausparasiten** *Aphelinus mali*. [Observations on the Behaviour of the Woolly Aphis Parasite, *A. mali*, in 1930.]—*Schweiz. Z. Obst- u. Weinb.*, xl, no. 5–6, pp. 117–119, 1 fig. Wädenswil, 4th March 1931.

Aphelinus mali, Hald., proved able to maintain itself through the winter of 1929–30 in Switzerland, as it did in the preceding year. As a result of liberations in 1929, ovipositing females were found in the spring of 1930, and in some cases a parasitism of up to 100 per cent. of the woolly apple aphis, *Eriosoma lanigerum*, Hausm., was achieved. The parasite was found in 1930 at distances of up to about 80 yards from the point of liberation in July 1929.

Puppini (G.). **Contributo alla conoscenza della** *Anarsia lineatella* **Zeller e appunti sulla** *Recurvaria nanella* **Hübn.** [A Contribution to the Knowledge of *A. lineatella* and Notes on *R. nanella*.]—*Boll. Lab. Ent. Bologna*, iii, pp. 182–220, 2 pls., 18 figs., 58 refs. Bologna, 1930. [Recd. 1931.]

The geographical distribution and food-plants of *Anarsia lineatella*, Zell., are recorded, and all stages are described. In Emilia, North Italy, it has two generations a year and attacks almond, peach, apricot,

plum, cherry and other plants. The larvae hibernate in the bark, becoming active in mid-March on almond, at the end of March on peach, and in mid-April on apricot and plum, when they begin feeding in the stems of the leaves and buds. As a rule they pupate among the leaves, the adults emerging, 8–15 days later, in May and June. The summer generation larvae usually feed in the fruits, sometimes, however, attacking the buds, and transform into adults in September-October. These deposit the eggs from which the hibernating larvae hatch. The larvae are attacked by two endophagous parasites, a Braconid, *Apanteles xanthostigmus*, Hal., and an Encyrtid, *Paralitomastix varicornis*, Nees, of which the former is the more important. A list is given of the parasites that have been recorded from Italy [*R.A.E.*, A, iv, 17] and France [xiii, 156], and methods of control are reviewed.

Recurvaria nanella, Schiff., attacks a variety of fruit trees in Emilia. The larva hibernates in cracks in the bark, under débris, etc., and when the buds open, spins together 4–5 apical leaflets and feeds on them. It also attacks the flowers, entering them through the calyx or through the half-open petals, and mines the fruits under the pericarp. In April-May the larva pupates in rough bark or among leaves, the pupal period lasting about a month. Two Braconid parasites, *Ascogaster annularis*, Nees, and *A. quadridentata*, Wesm., and the Tachinid, *Phytomyptera nitidiventris*, Rond. (*nigrina*, Stein), were obtained from the larvae.

GRANDI (G.). *Hypopta caestrum* **Hbn.**—*Boll. Lab. Ent. Bologna*, iii, pp. 221–244, 1 pl., 15 refs. Bologna, 1930.

The Cossid, *Hypopta caestrum*, Hb., all stages of which are described, was observed in May 1930 attacking asparagus in North Italy. The adults appeared in June and July. The eggs are laid in the ground, where the larvae live and mine the roots of asparagus. They feed until the advent of cold weather and then go deeper into the ground. In spring they become active again and, after feeding for a time, pupate about an inch deep in the soil in a gallery leading to the surface. The measures recommended are collection of the larvae and pupae, or fumigation of the soil with paradichlorobenzene.

MOKRZECKI (Z.). **Omacnica śpichrzowa** (*Ephestia elutella* **Hb.**) **jej biologja, szkody zrządzane prezez nią w surowcach tytoniowych i sposoby jej zwalczania.** [The Biology of *Ephestia elutella*, Hb., and the Damage it causes to raw Tobacco in Storehouses with Measures for its Control.]—*Doświadczalnictwo Rolnicze* [*Agric. Experimentation*], vi (1930), pt. 3, reprint 29 pp., 17 figs., 10 refs. Warsaw, 1931. (With a Summary in German.)

Ephestia elutella, Hb., all stages of which are described, has of recent years become an important pest of stored tobacco in Poland, having probably been introduced from Bulgaria where most of the tobacco for the Polish market is grown. Investigations by the author in Bulgaria in 1921 and again in the autumn of 1930 showed that this Pyralid is well established in the country, having two generations a year. In Poland there is usually only one generation a year, the adults

being on the wing from the end of April to the end of September, though in warm storehouses the moths, larvae and pupae may occur throughout the year. The moths live about a week. The eggs, of which one female may deposit 20–130, are laid on the leaves in the bales, usually on the sides unprotected by matting, a temperature of 15–20° C. [59–68° F.] being essential for oviposition. If the bales are packed in linen, the eggs are laid on the fabric, the young larvae readily penetrating through the meshes into the tobacco. The egg stage lasted 8–10 days at 15° C., 4 at 25° C. [77° F.] and 3 at 28° C. [82·4° F.]. The tobacco becomes infested only after it has been packed in bales and fermentation has taken place. The larvae show a definite preference for better qualities of tobacco, and higher grades in each quality ; *Nicotiana rustica* and other inferior tobaccos are not attacked. Analysis suggests that this is due to a higher content of sugar in better qualities. The larval period lasts about 10 months. In the spring, feeding starts at 15° C., the larvae being especially active from May to the end of August, at 25–30° C. [77–86° F.]. They may be forced to abandon the bales by raising the temperature in the store to 40–50° C. [104–122° F.], and watering the floor, when they collect in numbers round the small pools thus formed. They cease to feed at temperatures below 7° C. [44·6° F.] and above 37° C. [98·6 ° F.], and are killed at 45° C. [113° F.]. Pupation occurs in white silken cocoons, covered with the excreta of the larvae, the pupal period varying according to the temperature ; at 15–17° C. [59–62·6° F.] it lasted 16 days.

Microbracon (*Habrobracon*) *hebetor*, Say, which has two generations a year, has been reared from the larvae in Poland. A list of the parasites recorded in the literature is given.

Measures for preventing infestation are cleanliness and frequent whitewashing in tobacco stores, which should be dry but well aired, with glazed windows and cement flooring ; careful examination of the bales and removal of all infested leaves ; wrapping the smaller bales in thick brown paper, to prevent oviposition, and not allowing unwrapped bales to become covered with dust ; packing the better quality tobacco inside at least three layers of the low grades ; and the use of a special machine for compressing the leaves. Control methods include exposure to heat or fumigation with sulphur dioxide or hydrocyanic acid gas. The sulphur dioxide is generated by burning sulphur at the rate of 8 oz. to 100 cu. ft. at a temperature above 15° C. The sulphur, which burns better if 10 per cent. sodium nitrate is added, is placed on iron sheets at intervals of about 16 ft. on stands, with an 8 in. layer of earth on the top. Forcing the larvae to abandon the bales of tobacco by raising the temperature to 50° C. by means of charcoal stoves, which is a popular measure in Turkey, may affect the quality of the tobacco, owing to the sudden change in temperature and humidity, but experiments showed that exposing the bales to hot air in a special apparatus, by which the air is dried before it is heated, does not affect the tobacco. At temperatures of 45° C. [113° F.], 55° C. [131° F.] and 64° C. [147·2° F.], all larvae were killed in this way in 30, 10 and 5 minutes respectively, provided that the bales were opened. In tied and packed bales, however, they remained alive, as the temperature inside the bales did not exceed 37° C. [98·6° F.] though that in the chamber was raised to 70° C. [158° F.]. As the climate of Bulgaria is very favourable for the breeding of *E. elutella*, it is suggested that tobacco for export to Poland should not be kept in storehouses before despatch.

[Tzuigankov (S. K.).] **Цыганков (С. К.). Contribution to the Biology of Flies injurious to Cereals** (*Chlorops taeniopus*, **Meig.**, *Meromyza saltatrix*, **L.**, *Lasiosina cinctipes*, **Meig.**). [*In Russian.*] —*Trud. Poltavsk. s.-kh. opuitn. Stanz.* [*Trans. Poltava Agric. Expt. Sta.*], no. 90, Ent. Div. no. xvi, 53 pp., 21 figs., 7 refs. Poltava, 1930. [Recd. 1931.]

This is a detailed account of observations on the bionomics of *Chlorops taeniopus*, Mg., *Meromyza saltatrix*, L., and *Lasiosina cinctipes*, Mg., all stages of which are described, carried out in the Moscow and Poltava Governments, chiefly during 1924–27. The dates on which the various stages were observed varied considerably with the locality. The adults of the overwintered generation of *C. taeniopus* emerged in May, and those of the summer generation between June and August. They lived from 8 to 60 days. The effect of climatic and food conditions on the pre-oviposition period, which lasted 1–3 weeks, and the fertility of the flies is discussed. The oviposition period of the spring generation averaged 27 days and that of the summer one 50. The eggs are laid singly on the upper surface of the leaves, the number deposited varying from 20 to 140. In localities subject to sudden climatic changes, only 45 to 48 per cent. of the eggs hatch. The incubation period is usually 4–10 days, but at temperatures of about 8–10° C. [46·4–50° F.], it was prolonged to such an extent that 88 per cent. of the eggs were killed by a fungus. The pupal stage of the summer generation averaged 22 days. In mid-summer the flies migrate from summer cereals to wild grasses, and about late August or early September they return to sprouting winter crops, on which they oviposit until about mid-September.

The emergence of the overwintered generation of *M. saltatrix* begins a few days earlier than that of *C. taeniopus*, during the first three weeks in May, and that of the summer one in early July. The complete life-cycle of the summer generation occupies about 50 days. The adults of the overwintered generation lived from about a fortnight to two months, and those of the summer one slightly longer. The oviposition periods of the spring and summer flies lasted 40 days and two months respectively. Females laid about 10–60 eggs each, which hatched in 3–10 days. The pupal stage of the summer generation lasted 25 days. Little is known regarding the life-history of *L. cinctipes*. The larval and pupal stages occupied 20–25 and 12–15 days respectively, and emergence occurred during the first half of August. The adults were observed on early sown wheat, and in large numbers on uncultivated grasses, but by mid-September all had disappeared from the field.

The nature of the injury caused to cereals by these flies is discussed, and details are given of the extent of the damage done to different varieties of barley. Both *C. taeniopus* and *M. saltatrix* are able to complete their development in wild grasses, a list of some of which is given. Cultural methods of control include the sowing of less attractive or more resistant varieties, the ploughing under of all self-sown cereals, the destruction of grasses growing along the borders of the fields, and thorough manuring. Both barley and wheat that were planted in September were free from infestation by *C. taeniopus*. Sowing crops late in August or early in September, in order that they may escape the period of the mass emergence of the flies, is therefore recommended.

During 1927, 25–28 per cent. of the summer generation of *C. taeniopus* were found to be infested by Mermithids and Anguillulids, with the result that the egg-laying capacity of the females was reduced by about 50 per cent. The parasites reared from the different stages of both *C. taeniopus* and *M. saltatrix* included the Braconid, *Coelinius niger*, Nees, from the eggs; and the Pteromalids, *Stenomalus micans*, Ol., and *S. muscarum*, L., from the larvae, and *Micromelus rufomaculatus*, Wlk., which was also obtained from *L. cinctipes*, from the pupae. Other natural enemies of *C. taeniopus* were an undetermined red mite attacking the adults, and *Aeolothrips fasciatus*, L., destroying the eggs.

[SAKHAROV (N.).] **Сахаров (Н.). The Noctuid attacking Winter Crops.** [*In Russian.*]—Demy 8vo, 64 pp., 14 figs. Moscow, Gosudarst. sel'sko-khoz. Izd. R.S.F.S.R., 2nd edn., 1931. Price 35 *kop*.

A detailed account is given of the results of observations in the Lower Volga region on the bionomics and control of *Euxoa segetum*, Schiff., all stages of which are described. Two generations occur in a year. The winter is passed in the larval stage in the soil; only larvae that have reached the last (fifth) instar are able to survive the winter. The depth at which they occur varies from 5 to 11 ins. according to the nature of the soil. The overwintered larvae pupate in the spring without any further feeding. The first pupae were found on 3rd May. Pupation takes place at a depth of about 2 ins. in soil with a moisture content of 80 per cent., and at greater depths in drier soil. The adults of the overwintered generation occurred from 26th May until 1st July. In the insectary, females fed under normal conditions laid on an average 862 eggs each, and lived from 14 to 22 days, whereas those that had not received any food laid 8–44 eggs and lived only 7–10 days. The eggs are deposited on the lower leaves of all kinds of plants, many being also laid on the ground. The egg, larval, pre-pupal and pupal stages of the first generation lasted 6–7, 36, 2–3 and 13–14 days, respectively. In 1925 about 3–5 per cent. of the pupae resulting from the overwintered larvae did not give rise to adults until the autumn. The first generation moths occurred from 21st July until late autumn, being most numerous in the first half of August. The egg-stage of the second (overwintering) generation lasted 10–12 days and the larval, up to the fifth instar, 29–30. It is only this generation that is of economic importance. The larvae cause serious injury to winter rye and occasionally winter wheat. The nature of the damage they cause is discussed, and a list of their food-plants is given.

Control measures recommended include: letting the land lie fallow, with constant weeding during the egg-laying period; dusting with arsenicals; trenches to prevent the larvae from migrating to winter sown crops; poison baits; molasses traps against the adults; and hand collection of the larvae. In experiments with insecticides dusts were more effective than sprays. The percentage of mortality in 5 days was 92 with Paris green and lime, 1 : 7, 85 with sodium arsenite and lime, 1 : 4, 100 with calcium arsenite dust alone, and 50 with calcium arsenite and lime, 1 : 1. The parasites reared from *E. segetum* have already been noticed [*R.A.E.*, A, xviii, 237]. Various factors influencing its incidence from year to year are briefly reviewed, and experiments to determine the resistance of the larvae to cold are discussed in detail [xvii, 126].

The last 10 pages of the paper are devoted to observations on *Feltia exclamationis*, L., all stages of which are described. It hibernates as a larva in the soil, at a depth of about 6–7 ins., and pupates in the spring. The adults occur from 29th May until mid-July. In the insectary 16 females laid on an average 779 eggs each. The eggs are laid on the food-plants and on the ground, singly or in small batches. The incubation and pupal periods lasted 8–10 and 17–18 days respectively. The larval stage covers a period of 25–34 days for the first five instars, and the sixth lasts from the end of the summer till the following spring. The larvae feed throughout June and the beginning of July, after which they become inactive, and before hibernation enter a diapause, which occurs during August-September at a depth of 2–3 ins. in the soil. Although *F. exclamationis* normally has only one generation a year, in a few instances a second generation is produced during the summer by larvae that do not enter a diapause, but mature in about 32 days and pupate at a depth of 2½–3 ins. in the soil, the adults emerging 16–17 days later. These are present in the field from about 20th July until 20th August. Methods for the control of *F. exclamationis* are briefly reviewed, but so far no injury by it has occurred in the areas under review.

[SHAPIRO (D. S.).] **Шапиро (Д. С.). A Note on the Weevil attacking** *Camelina sativa* **L.** (*Ceuthorrhynchus syrites* **Germ.**). [*In Ukrainian.*] —*Shlyakhami Dosvidu*, iv, no. 4, reprint 4 pp., 4 figs., 5 refs. Kharhov, 1930.

In the Kharkov Government, considerable damage to *Camelina sativa* is caused by *Ceuthorrhynchus syrites*, Germ. [*cf. R.A.E.*, A, xix, 281], the adults and larvae of which are briefly described. From the end of May or beginning of June, the weevils occur on wild crucifers, and in the second half of June they migrate to *C. sativa*, on the leaves and flower-buds of which they feed, being especially abundant in July. As many as 80 per cent. of the buds are sometimes destroyed by them. Mating takes place at the end of June, and eggs are laid singly on the ovaries of the flowers. The larvae occur in the pods from the second half of July till about 20th September, feeding on the seed, and the adults begin to appear early in the latter month. Examination of infested pods in 1929 showed a loss of over 14 per cent. in the yield of seed.

[CHIGAREV (G.).] **Чигарев (Г.). On the Depth to which Paradichlorobenzene should be introduced into the Soil for Fumigation.** [*In Russian.*]—*Vestn. Vinogr. Vinodel. Vinotorg. S.S.S.R.*, ii, no. 2, pp. 117–122, 3 refs. Odessa, February 1930. [Recd. 1931.]

On the basis of laboratory and field experiments in the summer of 1929 in the vineyards of the lower Dnieper sands, the results of which are tabulated, the author dissents from the view that for the control of the larvae of *Polyphylla fullo*, L., in sandy soils, paradichlorobenzene should be applied at a depth of about 3½–4 ins. [*R.A.E.*, A, xvi, 293]. It was found that the fumigant diffuses upwards and downwards in the soil with equal rapidity, and that if it is near the surface a considerable amount is lost through evaporation

into the air. All the larvae of *P. fullo* and other Lamellicorns in the soil were killed when the fumigant was applied in holes at the rate previously described [*loc. cit.*], but at a depth of 10 ins., whereas when it was placed at depths of 2½ and 5 ins., the mortality of *P. fullo* was 93·8 and 93·2 per cent. respectively, though the other Lamellicorns were all killed. In another vineyard, paradichlorobenzene at a depth of 12 ins. killed 96 per cent. of *P. fullo* and 100 per cent. of other Lamellicorns, as compared to 65 and 98·2 per cent. respectively at a depth of 2½ ins.

[FEDOROV (S. M.).] **Федоров (С. М.).** *Polychrosis botrana*, **Schiff., as an important Pest of Vines in the Crimea.** [*In Russian.*]—*Vestn. Vinogr. Vinodel. Vinotorg. S.S.S.R.*, ii, no. 3, pp. 174–177, 2 figs., 9 refs. Odessa, March 1930. [Recd. 1931.]

It has been generally supposed that *Clysia ambiguella*, Hb., is the chief pest of vines in the Crimea. Investigations, however, show that it is *Polychrosis botrana*, Schiff., that has been responsible for serious damage to vines, particularly in 1929, and that *Clysia* seldom occurs in the peninsula and is entirely absent from the principal vine-growing districts. The author also believes that *Polychrosis* is an important pest of vines in Transcaucasia, whereas *Clysia* is chiefly injurious in the Ukraine. The susceptibility of different varieties of vine to these moths is discussed.

[EBERHARDT (G.).] **Эбергардт (Г.). A List of Pests and Diseases of Vines in the Daghestan S.S.R. in 1927 and 1928.** [*In Russian.*]—*Vestn. Vinogr. Vinodel. Vinotorg. S.S.S.R.*, ii, nos. 10–11, pp. 708–714, 762–770. Odessa, October–November 1930.

Brief notes are given on the distribution in Daghestan and in some cases on the seasonal occurrence and bionomics of the following vine pests: *Oecanthus pellucens*, Scop.; *Cetonia aurata*, L.; *Schistoceros bimaculatus*, Ol.; *Labidostomis lucida*, Germ.; *Tituboea macropus*, Ill., *Clytra valerianae*, Mén., and *C. novempunctata*, Ol. (*elata*, Wse.), the adults of which fed on the leaves and buds; *Byctiscus betulae*, L., which also attacked pears in vineyards; *Polychrosis botrana*, Schiff., of which the second and third generations alone caused damage; *Sparganothis pilleriana*, Schiff.; *Theresia* (*Procris*) *ampelophaga*, Bayle; *Antispila rivillei*, Staint.; *Porthetria* (*Lymantria*) *dispar*, L.; *Chaerocampa alecto*, L.; *Deilephila* (*Celerio*) *lineata livornica*, Esp.; the mites, *Tetranychus telarius*, L. (*Epitetranychus althaeae*, v. Hanst.) and *Eriophyes vitis*, Nal., of which the latter only caused negligible damage; and the Coccids, *Pseudococcus citri*, Risso, and *Pulvinaria betulae*, L., which hibernates in the soil at a depth of 2–8 ins. *Euxoa tritici*, L., occurred in the Derbent district only, where serious damage was done to buds and young shoots of vines and beet was also infested. The control measures recommended include flooding the vineyards in the spring, wherever this is possible, to destroy the larvae, and digging up the soil in the second half of May to kill the pupae. *Amblyteles infractorius*, Panz., *Meteorus rubens*, Nees, and *Apanteles* sp. were reared from the larvae.

[NOVINENKO (A. I.).] **Новиненко (А. И.). Insects as Carriers of Mosaic Disease of Sugar Beet.** [*In Russian.*]—*Khar'kovsk. oblastn. sel'sko-khoz. opuitn. Stanz.*, Ent. Otd., no. 13, 15 pp., 3 figs., 2 diag., 19 refs. Kiev, 1930. (With a Summary in English.)

Experiments on the transmission of mosaic disease of sugar-beet by insects in the Ukraine are described [*R.A.E.*, A, xvii, 8]. Further work showed that the number of insects infesting a plant is not always the principal factor influencing the intensity of infection, and confirmed the view that though Capsids and Jassids individually are less efficient vectors than *Aphis fabae*, Scop., they move about so much more that they may be of more importance in the field. Experiments in which *A. fabae* was allowed to feed on diseased plants for various periods of time, and was subsequently transferred to healthy ones, either immediately or after 18 or 36 hours, indicate that the disease does not depend on mechanical transmission alone. Further experiments showed that Aphids fed on infected sugar-beets of the second year grown for seed (many of which are already infected when they begin to grow and which are the first to be visited by the insect) are able to transmit the disease to weeds such as *Chenopodium album*, *Amarantus retroflexus*, and *Sonchus arvenis*, and from the last two to sugar-beets of the first year. The farther first-year beets were removed from sources of infection (weeds and beets grown for seed), the smaller was the percentage infested by Aphids, and consequently infected with the disease. Plants at a distance of 765 yards were practically safe from infection. Measures preventing the spread of the disease include the destruction of weeds and of insect vectors and the selection of healthy plants for the seed crop.

[PEREPECHAĬ (P. A.).] **Перепечай (П. А.). The Damage caused to Vineyards in Kamuishevskaya by** *Rhynchites betuleti* **Fabr.** [*In Russian.*]—*Vestn. Vinogr. Vinodel. Vinotorg. S.S.S.R.*, ii, no. 7, pp. 547–548, 1 fig., 2 refs. Odessa, July 1930. [Recd. 1931.]

Byctiscus betulae, L. (*Rhynchites betuleti*, F.), which was first observed in vineyards in the Crimea in 1927, caused considerable injury to vines in 1929; in one vineyard about 30 per cent. of the entire leaf-surface was destroyed. The adults oviposit in May, from 2 to 12 eggs being laid inside leaves rolled by the females. The larvae appear in June, and after 3 weeks pupate in the soil, the adults emerging in August. Hibernation is passed in the adult stage in the soil or under the bark. The collection and burning of the rolled leaves was carried out in mid-June and repeated 3 or 4 times during the summer, and large numbers of adults were jarred off the vines on to sheets. Spraying with 1 lb. Paris green to 120 gals. Bordeaux mixture only caused the weevils to migrate to adjacent vines.

[SERGIEV (L. M.).] **Сергиев (Л. М.). Fruit-growing in the Tuapse Region.** [*In Russian.*]—*Vestn. Vinogr. Vinodel. Vinotorg. S.S.S.R.*, ii, no. 12, pp. 849–864, 4 figs. Odessa, December 1930.

Lists are given of the chief orchard pests occurring in the Tuapse region on the Black Sea, with brief notes on their economic importance. They include *Aphis pomi*, DeG. (*mali*, F.), *Eriosoma lanigerum*, Hausm., *Anthonomus pomorum*, L., *Hyponomeuta malinellus*, Zell., and *Cydia*

(*Carpocapsa*) *pomonella*, L., on apple ; *Cydia* (*Grapholitha*) *funebrana*, Tr., and *Eurytoma amygdali*, Endl., on plums ; *Psylla pyri*, L., on pears ; and *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, L.), *Malacosoma neustria*, L., and *Porthetria* (*Lymantria*) *dispar*, L. In 1930 *Tortrix rosana*, L., appeared during the summer in plantations of young apples, and caused severe injury to the foliage.

[Yakhontov (V. V.).] **Яхонтов (В. В.). A Pest of Winter Grain Crops—the Swamp Beetle** (*Helophorus micans* **Fald.**). [*In Russian.*]—*Za Rekonstr. sel'sk. Khoz.* [*For the Reconstr. Agric.*], i, no. 5, pp. 73–76. Samarkand, August 1929. [Recd. 1931.]

A survey in the environs of Old Bokhara in 1928 showed that there is a definite relation between the injury caused to cereals by the Hydrophilid, *Helophorus micans*, Fald., and the time of flooding the fields before sowing [*cf.* *R.A.E.*, A, xvi, 487]. In the case of winter wheat, the maximum injury was caused where flooding had been carried out at the end of September. The resistance of a number of varieties of winter wheat to the attacks of this pest is discussed, and notes are given on its bionomics and control [*cf.* *loc. cit.*]. The author considers that under the conditions of Central Asia, early sowing of winter crops would be the most suitable method of avoiding injury.

The Distribution of *Platyedra gossypiella* **in the Belgian Congo.**

A letter received from Dr. H. Schouteden records the finding of the pink bollworm [*Platyedra gossypiella*, Saund.] in Uelé, thus extending its recorded distribution in the Belgian Congo [*cf.* *R.A.E.*, A, xvi, 303, 535 ; xviii, 260].

King (H. H.) & Bedford (H. W.). **An Account of the Locust Season 1929.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 31, pp. 7–14. Khartoum, January 1930. [Recd. 1931.]

The invasion of the Anglo-Egyptian Sudan by the desert locust [*Schistocerca gregaria*, Forsk.] was of moderate proportions in 1927 and 1928 [*cf.* *R.A.E.*, A, xix, 166], but the numbers of locusts in 1929 were greater than had been observed for at least 30 years. Breeding took place mainly in the Berber province, where severe damage was caused to cotton and grain crops, and in Kordofan and Darfur, where it was impossible to organise effective control operations owing to the enormous extent of the country and the sparseness of the population. In most other provinces control measures proved to be very effective and direct damage by hoppers was largely prevented by the application of poison bait [xvii, 507]. The amount of bait prepared for control proved to be insufficient, and mechanical methods had to be adopted in some areas.

Ruttledge (W.). **A Note on the Control Measures used against Locusts in Northern Kordofan.**—*Bull. Wellcome Trop. Res, Lab. Sudan Govt.*, Ent. Sect., no. 31, pp. 15–18. Khartoum. January 1930. [Recd. 1931.]

In 1929 the first swarms [of *Schistocerca gregaria*, Forsk.] in northern Kordofan were reported in June, and a further invasion occurred in

July. The eggs were almost invariably deposited in sandy hillocks with scanty vegetation, and an extensive hopper infestation followed.

The men engaged in hopper destruction were mounted on camels and worked in pairs in extended order at intervals of 80 yards. Whenever bands of hoppers were encountered, the pair stopped and distributed poison bait. First stage hoppers were poisoned by throwing bait among them, the second and third by laying a line of bait 5 yards ahead of the band, and the fourth and the fifth, which occurred mostly in water courses, by laying the bait 20–50 yards ahead of the band, with a second belt of poison 10 yards ahead of the first when the band was more than 10 yards deep. In cases of very deep bands, it was considered advisable to cut across them at right angles at intervals of 20–50 yards, laying a line of poison in each place. Each pair of workers could cover $\frac{1}{3}$ sq. mile a day, and the quantity of bran used by them daily was one sack for the first and second instars, and 2–3 sacks for later ones. The optimum instars for poisoning were the second and third.

Darling (R. C. M.). **The Winter Breeding of Locusts in the Sudan. Season 1929–30.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 31, pp. 19–21. Khartoum, January 1930. [Recd. 1931.]

In the Anglo-Egyptian Sudan, the swarming phase locusts [*Schistocerca gregaria*, Forsk.] breed in two principal areas and seasons. During the rainy season most of the northern Sudan west of the Red Sea hills may be infested with hoppers. There is usually only one generation, and the adults migrate in a sexually immature state. From December to March breeding may take place on the Red Sea littoral, but in 1929–30 it occurred only on a small scale, because the majority of migrating swarms did not remain in the area until they were ready to oviposit. The most favoured localities for winter breeding are the grassy watercourses on the coastal plain proper. Breeding apparently does not take place in the hills bordering the plain on the west, owing to the low temperature and rains prevailing there. A third breeding area was observed in 1929–30 in the Argo and Kerma basins of the Dongola province. There the hopper bands were thinned out by burning and poison bait, and the insects reverted to the solitary phase.

King (H. H.). **Experiments with Arsenite of Soda and Sulphate of Copper for the Protection of Timber against attack by Termites.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 31, pp. 22–32, 1 pl., 3 fldg. diag. Khartoum, January 1930. [Recd. 1931.]

Timber impregnated with creosote under pressure is proof against termite attack but will not take paint, nor can it be so treated unless the necessary plant is available. The experiments described were therefore undertaken with a view to ascertaining whether treatment with sodium arsenite or copper sulphate could be substituted, as both these materials are cheap and wood treated with either may afterwards be painted.

The following is taken from the author's summary: The timber used in the experiments was buried for at least 5 years. Results show that treatment with copper sulphate is of little value, but that sodium

arsenite affords good protection over a period of years to white wood (*Pinus* sp.), native hard wood (*Acacia arabica*) and palm wood (*Hyphaene thebaica*), which is frequently used in constructing the roofs of cheap buildings [*cf.* *R.A.E.*, A, xvi, 166]. There was no marked difference in the results obtained from using 5, 10 or 15 per cent. solution or from soaking for 24 or 48 hours. It seems probable that the most practical treatment is soaking for 24 hours in 10 per cent. solution. The value of a coating of tar to prevent the leaching out of the sodium arsenite is clearly indicated. In the case of wood that will be exposed to rain, a coating of oil paint may be substituted.

BEDFORD (H. W.). **A Report on Work carried out at the Khartoum Laboratory during 1929.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 31, pp. 33–38. Khartoum, January 1930. [Recd. 1931.]

Owing to the negligible numbers of *Diparopsis castanea*, Hmps. (Sudan bollworm), occurring in 1929 in the vicinity of Khartoum, the breeding of *Microbracon brevicornis*, Wesm., was ultimately discontinued. In February, an additional host of this parasite was found, the Noctuid, *Eublemma baccalix*, Swinh., the larvae of which feed inside the flowers of morning glory (*Ipomoea rubrocoerulea*). The alternative host of *M. kirkpatricki*, Wlkn. [*R.A.E.*, A, xix, 166], which has been identified as the Tortricid, *Crocidosema plebeiana*, Zell., was observed to be extremely active on *Abutilon* spp. during August-October, the normal time for the sowing of cotton and the growth of its early stages, prior to the appearance of *Platyedra gossypiella*, Saund. Observations on fruits of *Abutilon* spp. show that these plants act as alternative hosts of two cotton pests, *Earias insulana*, Boisd., and *Oxycarenus hyalinipennis*, Costa. The former is often attacked by parasites of other pests of cotton, including *M. brevicornis*, *Elasmus johnstoni*, Ferr., *Apanteles earterus*, Wlkn., and *Chelonella curvimaculata*, Cam.* It therefore appears that these plants should be encouraged in order to act as a reservoir for these parasites during the dead season for cotton and to attract *E. insulana* during the cotton season.

From September to December 1928 serious damage to melons and watermelons was caused by the Pentatomid, *Aspongopus viduatus*, F., and *Epilachna chrysomelina*, F. Large numbers of the pests were destroyed by hand-picking in November and December. During 1929, neither was sufficiently numerous to cause serious damage, and although the control measures undertaken during the previous year cannot be assumed to have been entirely responsible for this result, it is likely that they had a distinctly beneficial effect.

As field trials on growing castor [*Ricinus communis*] have been carried out, investigations on the pests of this plant were undertaken. The Noctuid, *Eublemma brachygonia*, Hmps., and an undetermined caterpillar injured the fruit, and the foliage was damaged chiefly by *Tetranychus telarius*, L., and occasionally by the larvae of the Noctuid,

* We are informed by Mr. D. S. Wilkinson that there are reasons for supposing that this record may be due to a misidentification by himself. Two of the hosts of the parasite in question are *Heliothis obsoleta*, F., and *Platyedra gossypiella*, Saund., and a parasite of these hosts, identified as *C. curvimaculata* from the Sudan, has proved to be an undescribed species of the same genus. Mr. Wilkinson has now no record of the occurrence of *C. curvimaculata* from the Sudan.—*Ed.*

Achaea catella, Guen., and of an undetermined Pyralid. Two Jassids, *Empoasca facialis*, Jac., and an undetermined species, were also found on the leaves, but cause little damage. The Buprestids, *Sphenoptera arabica*, Gory, and *S. fulgens*, Gory, have sometimes been bred from the stems of castor oil plants from this locality.

Each year dura (*Sorghum vulgare*) grown on land flooded by the river in the White Nile Province, is subject to a certain amount of damage by *Tanymecus sparsus*, Fhs., which destroys the young plants as they come up by feeding on the foliage. The weevils are at times a serious pest in plantations of young *Acacia arabica* and also occur on cotton.

In one locality senna was severely damaged by *Catopsilia florella*, F. During recent years the most serious pest of this crop has been *Pachymerus pallidus*, Ol., which feeds on the seeds and reduces the market value of the pods. This Bruchid was reported to be comparatively scarce during the year under review.

Bedford (H. W.). **A preliminary Note on Die-back of Sunt** (*Acacia arabica*, **Willd.**).—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 31, pp. 39–41. Khartoum, January 1930. [Recd. 1931.]

The condition of *Acacia arabica* known as "die-back," which is becoming more serious every year, appears to be directly due to Buprestid larvae, which gradually tunnel deeper and deeper into the bast layer, groove the sapwood, and eventually completely encircle the branch before burrowing deep into the heartwood, where pupation takes place. The most common species connected with this condition appears to be *Anthaxia congregata*, Klug, from which the Braconid, *Hecabalodes anthaxiae*, Wlkn., was reared on one occasion. *Chrysobothris dorsata*, F., and an undetermined Buprestid have also been reared from branches showing die-back symptoms. Branches that have been injured by die-back are subject to attack by the Bostrychids, *Sinoxylon senegalense*, Karsch, and *S. sudanicum*, Lesne, which complete the destruction of the timber if they are sufficiently numerous. If it should be definitely proved that die-back is primarily due to the attacks of Buprestids, it is suggested that infested branches should be cut out and burned. From present information it appears that this should be done during February-April, but further research on this point is needed.

Johnston (H. B.). **Summary Report on the Entomological Work of the Gezira Laboratory for the Year 1929.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 31, pp. 42–47. Khartoum, January 1930. [Recd. 1931.]

Much of the work carried out in the Gezira area is reported on in subsequent papers of this series. In 1928 a moderate rainfall and the early drying up of weeds on fallow land tended to encourage an early migration of *Selenothrips* (*Heliothrips*) *indicus*, Bagn., to cotton, which was severely injured. In 1929 these conditions were not repeated, and when migration took place, the cotton was well-grown and damage was largely confined to those portions of the crop that had had to be resown Experimental work on this pest has confirmed previous views that cotton sown late (September) is most heavily attacked and

that, in the case of cotton sown at the normal date in August, spacing is an important factor—the wider the spacing, the higher the infestation. Owing to the occurrence of an increased amount of leaf-crinkle in 1928–29, investigations on Jassids were undertaken. *Empoasca facialis*, Jac., is probably the commonest species but does no direct damage in the Gezira district, and no indication has been found of any species of Jassid acting as vector of crinkle. *Sesamia cretica*, Led., which appears to be the only species of this genus that attacks dura [*Sorghum vulgare*], caused considerable damage to river-grown crops in 1929. Further investigations support the opinion already expressed that stored stalks are probably the main source of infestation for the new crop. The Coreid, *Acanthomia brevirostris*, Stål, has been found attacking *Dolichos lablab*.

In the autumn of 1929 cotton was damaged in the Gezira by adults of the Acridid, *Kraussaria angulifera*, Kr., which had migrated from the adjoining river forest land and laid eggs in land under irrigation. The development of the embryo in this species is of the delayed type and the crop is not in danger from hoppers. Breeding experiments with *Cyrtacanthacris tatarica*, L., proved that in this Acridid the crowding of hoppers produces a change in colour from green to brown. The colour is controlled rather by the fact of association of individuals than by the room space allotted. It was noticed, for example, that in no instance does a single hopper turn dark if reared alone, regardless of the size of the cage employed, whereas in cases when two individuals were reared together, one, or both, usually became dark.

KIRKPATRICK (T. W.). **Pink Bollworm** (*Platyedra gossypiella* **Saund.**) **in the Gezira during 1929.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 31, pp. 48–54. Khartoum, January 1930. [Recd. 1931.]

An attempt was made to ascertain why *Platyedra gossypiella*, Saund., is less injurious to cotton in the Gezira area than in Egypt and other cotton-growing countries. An examination of the rate of infestation of green bolls from three localities was made every 10 days, and it is believed that the difference in progress of the infestation in Egypt and the Gezira is largely due to the fundamental difference in climatic conditions during the season when the cotton is maturing. In Egypt this takes place at the warmest time of the year (July to September), whereas in the Gezira bolls are forming, and the bollworms consequently breeding, during the coldest moths. It seems probable that *P. gossypiella* is scarcely able to do more than maintain its numbers during the weather that normally prevails in the Gezira from November to the middle of January. Moreover, the short-cycle larvae drop to the ground when mature and pupate under dead leaves or in the top few inches of soil, and it is highly probable that those under leaves are killed by the heat of the sun during February and March, and those in the soil are more or less sealed up, after irrigation, in the stiff Gezira clay. Thus it appears likely, provided that the initial supply of bollworms is small and the winter at least as cold as in 1928–29, that *P. gossypiella* is incapable of an increase sufficiently rapid for it to assume serious proportions.

A study of the emergence of long-cycle larvae showed that the majority appear during July and August and must therefore die without any prospect of reproduction, even if they escape the ginning

of exported cotton or the sunning of the cotton kept for seed. Those contained in cotton and dead bolls that fall to the ground are killed by the sun in April or May, or, if they fall into cracks or are washed there by the first rain, they are exposed to the attacks of rats and termites or are sealed up in the clay. Thus the low incidence of *P. gossypiella* in the Gezira appears to depend on low winter temperatures, efficient sunning of the cotton seed that is to be kept in the country and the prevention of cotton being stolen and hoarded in villages.

Cameron (W. P. L.). **Cotton Thrips** (*Heliothrips indicus* **Bagnall) in the Gezira in 1929.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 31, pp. 55–63. Khartoum, January 1930. [Recd. 1931.]

In the course of observations on *Selenothrips* (*Heliothrips*) *indicus*, Bagn. (cotton thrips) in the Gezira area during 1929, a regular succession of food-plants was found on which the pest breeds prior to its main attack on cotton; these consist of grasses, including dura (*Sorghum vulgare*), and various weeds. Experiments with watering showed that ordinary irrigation lowered the emergence of adults from the soil to a certain extent, and flooding reduced the numbers still further, but flooding of the ridges, where the majority of the thrips hibernate [*cf.* *R.A.E.*, A, xix, 166], is difficult and water cannot always be obtained and quickly applied to a certain area at a given time. Some benefit was derived in experimental plots from a trap crop of cotton planted about a month after the main crop, but a further trial with sowings at a longer interval is essential.

Johnston (H. B.). **A Note on certain minor Crop Pests hitherto unrecorded from the Gezira District of the Sudan.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 31, pp. 67–70. Khartoum, January 1930. [Recd. 1931.]

Brief notes are given on the life-history of five minor crop pests in the Gezira irrigated cotton district. The Noctuid, *Eublemma brachygonia*, Hmps., attacks dura (*Sorghum vulgare*) particularly in October and November. It has not been found on cotton in the Sudan [*cf.* *R.A.E.*, A, vi, 70]. An undetermined Chalcid (probably a species of *Brachymeria*) parasitised 61 per cent. of the pupae in 1927. One parasite emerges from each host. Unparasitised hosts appeared 3–5 days before the emergence of the majority of parasites. The Nitidulid, *Carpophilus dimidiatus*, F., and the Mycetophagid, *Typhaea stercorea*, L., were associated with the larvae of *E. brachygonia* in the heads of dura.

Another Noctuid, *Proxenus melanospila*, Guen., has been observed damaging the foliage and pods of *Dolichos lablab* during November-February. Much of the damage had previously been attributed to *Heliothis obsoleta*, F. A few of the pupae are infested by a Hymenopterous parasite, and the larvae by certain Tachinids. The Pyralid, *Etiella zinckenella*, Tr., attacks the green pods of *Dolichos lablab* and *Cajanus indicus*, frequently in association with the larvae of *H. obsoleta*. Certain undetermined Tachinids have been bred from the pupae. Another Pyralid, *Hellula undalis*, F., is a widespread pest of cruciferous crops. The larva eats the growing point of cabbage and burrows in the stem and larger leaves. A Braconid parasite has been reared from the larvae.

The Pterophorid, *Sphenarches caffer*, Zell., attacks the flowers and flower buds of *Dolichos lablab*. The pods are occasionally attacked through the larger holes made by *H. obsoleta*. The pest is present on the crop throughout the winter months and may increase in numbers during January and February. Should it occur in large numbers it would undoubtedly affect the yield to a serious extent. The most important parasite appears to be the Braconid, *Apanteles paludicolae*, Cam., but the maximum rate of parasitism observed was only 28 per cent. The pupal period of the parasite lasts 4–7 days.

Cowland (J. W.). **Report on the Entomological Work of the Berber Field Laboratory for the Year 1929.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 31, pp. 71–75. Khartoum, January 1930. [Recd. 1931.]

During 1929, *Platyedra gossypiella*, Saund., caused an average loss of one-third of the cotton crop throughout Berber Province. The date of sowing is to be advanced, and an early-maturing variety is to be grown in an endeavour to obtain as large a yield as possible before the pest becomes numerous. Examinations of open cotton bolls collected from a locality where the cotton is cut out in January showed them to contain large numbers of resting larvae in December, whereas in two localities where the crop is not cut out until April, few larvae were found until February. *Microbracon kirkpatricki*, Wlkn., has not been found in sufficient numbers to affect the control of *P. gossypiella* appreciably. *Diparopsis castanea*, Hmps., caused little damage to the cotton crop. *Sesamia cretica*, Led., caused severe injury to maize during the early part of 1929, the main damage being to the winter crop and to dura (*Sorghum vulgare*) sown late as the river subsided. The eggs are laid under the sheathing leaves on dura or maize, usually in batches of 10–20. An unidentified Hymenopterous parasite destroyed 60–70 per cent. and was found to be distributed throughout Berber Province. In the laboratory, the life-cycle occupied about 12 days during October, but at lower temperatures was prolonged to about a month. Females were more numerous than males.

Lucerne (*Medicago sativa*) was repeatedly defoliated in one locality by successive broods of *Laphygma exigua*, Hb. The attacks were severe and prolonged (lasting from March to October) but were eventually controlled by the Braconid, *Disophrys lutea*, Brullé. The eggs of *L. exigua* are laid on the lower surface of the leaves, oviposition beginning 2 days after emergence and continuing daily for 4 or 5 days. The egg stage lasted about 2 days and the larval stage averaged 14, both depending on the temperature. Pupation takes place in the soil and the moths emerge in 6–7 days. A larva parasitised by *D. lutea* develops normally until it is full-grown, when the parasites emerge and pupate in the soil, the pupal period lasting about 10 days.

Whitfield (F. G. S.). **Report on the Entomological Work of the Talodi Field Laboratory for the Year 1929.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 31, pp. 76–78. Khartoum, January 1930. [Recd. 1931.]

In the Nuba Mountains Province *Sylepta derogata*, F., is severely parasitised and, except for a few cotton plants destroyed early in the season, is unable to effect much damage. Seven species of Hymen-

opterous parasites have been bred from the larvae and 5 from the pupae ; a hyperparasite also occurs in some numbers.

Control measures against *Dysdercus fasciatus*, Sign., and *D. superstitiosus*, F., consist in destroying as far as possible the colonies of stainers sheltering on the baobab trees (*Adansonia digitata*) at the beginning of the cotton-growing season, and later, in destroying any colonies occurring in the cotton fields [*cf. R.A.E.*, A, xvi, 156]. As promising results were obtained in experiments in which fruit was removed from the baobabs with a view to depriving the stainers of food during the summer when they are dependent on the seeds, further experiments were undertaken to ascertain whether heavy or light pruning of the trees will prevent them from producing fruit for one or more seasons. Pollarding the trees to facilitate the removal of the fruit will also be carried out. As the trunk of this tree furnishes a useful fibre, their wholesale destruction is not desirable. A paraffin spray is also used against stainers on them and on cotton. Except in one locality where about 50 per cent. of the crop was injured, only about 7 per cent. of the cotton bolls were attacked by *Platyedra gossypiella*, Saund., which appears to be controlled by its natural enemies. The Halticid, *Podagrica puncticollis*, Weise (cotton flea-beetle), also appeared on cotton in small numbers.

Ruttledge (W.). **Survey of the Pests affecting Cotton and other Crops in Mongalla Province.**—*Bull. Wellcome Trop. Res. Lab. Sudan Govt.*, Ent. Sect., no. 31, pp. 79–82. Khartoum, January 1930. [Recd. 1931.]

The following were the most important pests of cotton observed in Mongalla Province during 1929 : *Dysdercus superstitiosus*, F., *D. cardinalis*, Gerst., *D. nigrofasciatus*, Stål, *Heliothis obsoleta*, F., *Platyedra gossypiella*, Saund., and three species of *Oxycarenus*. The alternative food-plants of the species of *Dysdercus* are shown in tables, and the times of their probable migrations to and from cotton, various Malvaceous weeds, and *Sterculia* sp., are given.

Grunwald (H.). **Rizinus.** [The Castor Oil Plant.]—*Beih. Tropenpfl.*, xxvii, no. 1, 58 pp., 12 figs., 55 refs. Berlin, December 1930. Price *M*.3.

Two pages of this paper are devoted to the diseases and pests recorded on the castor oil plant (*Ricinus communis*). In India, the chief production region, the Noctuid, *Achaea janata*, L., is widespread, the larvae feeding on the leaves and branches of young plants. The female lays about 400 eggs on the lower surface of the leaves. They hatch in 2–4 days, and the larvae feed for 2 or 3 weeks on the leaves, and then pupate in the ground. *Empoasca notata*, Mel., and the Arctiid, *Pericallia ricini*, F., are also injurious, especially the latter, against which smoke torches are used. Other pests include the Tingid, *Corythuca gossypii*, F., *Euproctis lunata*, Wlk., *Prodenia litura*, F., *Aleurodes ricini*, Misra, *Xyleborus fornicatus*, Eichh., and *Diacrisia obliqua*, Wlk. *Notolophus posticus*, Wlk., is widespread in Ceylon. Pests recorded in the Netherlands Indies are the Eumolpid, *Phytorus dilatatus*, Jac., the Pyralid, *Dichocrocis punctiferalis*, Guen., *Agromyza* (*Melanagromyza*) *ricini*, de Meij., and *Xyleborus fornicatus*. In Brazil, *Stephanoderes seriatus*, Eichh., has been observed in the fruits. In Algeria, *Phycita diaphana*, Stgr., was very injurious from 1913 to 1927,

the larvae feeding on the leaves, buds and young flowers. This Pyralid, however, did little harm in well-irrigated plantations. Other pests are the Noctuid, *Grammodes geometrica*, Rossi, in Sicily; *Parasa vivida*, Wlk., in Nyasaland; *Porthesia* (*Arctornis*) *producta*, Wlk., and *Argyroploce leucotreta*, Meyr., in Uganda; and *Achaea* (*Ophiusa*) *catella*, Guen., in the Transvaal.

HUTSON (J. C.). **Report of Insect Pests in Ceylon during 1930.**—17 pp. typescript. Peradeniya, 1931.

Many of the major pests recorded in this report have been dealt with in papers already noticed [*R.A.E.*, A, xviii, 558; xix, 137, 254, etc.]. Other pests include *Suastus gremius*, F., and *Aularches miliaris*, L. (spotted locust) on coconut; *Parnara bada*, Moore, on rice; the Coreids, *Anoplocnemis phasiana*, F., and *Petalocnemis obscura*, Dall., and the Tingid, *Urentius echinus*, Dist., on egg-plant (*Solanum melongena*); *Cyphosticha coerulea*, Meyr., and *Agromyza* sp. on beans; *Mylabris pustulata*, Thnb., on *Cajanus indicus*; *Dacus cucurbitae*, Coq., on vegetable marrows; *Margaronia* (*Diaphania*) *indica*, Saund., on melon and snake gourd (*Trichosanthes anguina*); *Calotermes* (*Glyptotermes*) *dilatatus*, Bugnion & Popoff, recorded for the first time on horse-radish tree (*Moringa pterygosperma*); the weevils, *Episomus figuratus*, Karsch, and *Astycus immunis*, Wlk., on orange; the shoot-borer, *Leucinodes orbonalis*, Gn., and the Pentatomid, *Coptosoma siamica*, Wlk., on mango; *Euproctis* sp. and *Virachola isocrates*, F., on pomegranates; the Eumolpid, *Scelodonta dillwyni*, Steph. (*nitidula*, Baly) on grape vines; and *Acrocercops ordinatella*, Meyr., on avocado pear (*Persea gratissima*). On green manure plants and cover crops, besides termites and the more usual pests, *C. siamica* and *Aphis gossypii*, Glov., were recorded on *Tephrosia candida*, *Prodenia litura*, F., on *Indigofera endecaphylla*, and the Capsid, *Ragmus importunitas*, Dist., on *Crotalaria verrucosa*. Further investigations into the life-history of *Rhyncophorus ferrugineus*, F. (red coconut weevil) show that the complete life-cycle from egg to adult lasts about 8–10½ weeks under insectary conditions at Peradeniya and may possibly be even shorter in coastal areas or at low elevations; this is shorter than stated in previous records. Against the larvae of the Bombycid, *Ocinara varians*, Wlk., which has recently been recorded as a pest of jak (*Artocarpus integrifolia*), tests indicate that a spray of 1 lb. hard or soft soap in 8 gals. water will kill the young larvae, the older ones requiring 1 lb. to 6 gals.

LEEFMANS (S.). **Ziekten en plagen der cultuurgewassen in Nederlandsch Oost-Indië in 1929.** [Diseases and Pests of cultivated Plants in the Netherlands Indies in 1929.]—*Meded. Inst. PlZiek.*, no. 79, 100 pp. Buitenzorg, 1930. [Recd. 1931.]

Most of the pests recorded here have been noticed in previous reports [*R.A.E.*, A, xviii, 193, etc.]. Considerable injury to maize was caused by the larvae of *Hypomeces squamosus*, F., on the island of Kangean, and by *Agrotis ypsilon*, Hfn., in some parts of Celebes. Against the latter, parasites imported from Java were liberated on two occasions. On coconut in Java *Tirathaba rufivena*, Wlk., formerly recorded as *Mellisoblaptes rufovenalis*, Snell., is kept in check by parasites. The Trypetid, *Anomaea albiscutellata*, De Meij., seriously injured coffee in

some plantations in Java, but was controlled after some months by Chalcid parasites. The coffee berry borer, *Stephanoderes hampei*, Ferr., caused more damage than in the previous year ; in some cases a crop loss of 40 per cent. was reported. The unevenness of infestation of sugar-cane in various parts of Java by *Scirpophaga nivella*, F. (*auriflua*, Zell.) is partly due to weather, as mortality of the larvae is higher if the shoots into which they have to bore are dry and hard. This explains why the attack is unimportant in areas with a prolonged and severe dry season and why certain varieties of cane suffer less than others.

DAVIDSON (J.). **Insects observed on Crops in South Australia during Period June, 1928, to June, 1930.**—*J. Dept. Agric. S. Aust.*, xxxiv, no. 7, pp. 741–745. Adelaide, 16th February 1931.

This first biennial report from South Australia includes records of a large number of pests recently observed, many of which have been noticed in previous papers. Others include the Lycaenid, *Zizina labradus*, Godart, the larvae of which attacked the flowers of lucerne ; the Dynastid, *Isodon pecuarius*, Reiche, which destroyed the tips of tomato plants ; the Aphids, *Capitophorus fragariae*, Theo., on strawberries, and *Cavariella pastinacae*, L., and *C. aegopodii*, Scop., on parsnips ; *Cryptophasa unipunctana*, Don. (apricot borer) and *Phalaenoides* (*Agarista*) *glycinae*, McLeay (vine moth), which were prevalent in the south-east ; *Caliroa limacina*, Retz. (*cerasi*, L.), a serious pest, on pears and hawthorn [*Crataegus*] ; and *Leptops rhizophagus*, Lea, and *L. robustus*, Ol., on apple. *Heliothis obsoleta*, F., was observed boring into young apples and eating the tips of young shoots, apricots and plums being similarly attacked. *Animula* (*Thyridopteryx*) *herrichi*, Westw. (case moth) and *Roeselia* (*Nola*) *metallopa*, Meyr., were very injurious to young gum trees [*Eucalyptus*].

Cryptophasa unipunctana caused damage to swamp oaks [*Casuarina*]. The green cockchafer, *Diphucephala colaspidoides*, Gyll., was very abundant on young wattle [*Acacia*] and may occasionally attack fruit trees.

THORPE (W. H.). **The Biology, post-embryonic Development, and economic Importance of** *Cryptochaetum iceryae* **(Diptera, Agromyzidae) parasitic on** *Icerya purchasi* **(Coccidae, Monophlebini).**—*Proc. Zool. Soc. London*, 1930, pt. 4, pp. 929–971, 5 pls., 23 figs., 2 pp. refs. London, 21st January 1931.

The following is largely taken from the author's summary : The life-history of *Cryptochaetum iceryae*, Williston, which is parasitic on *Icerya purchasi*, Mask., in California is described. The history of the original introduction of *Cryptochaetum* from Australia was investigated, and it appears probable that both *C. iceryae* and *C. monophlebi*, Skuse, were introduced, but that the former alone became established, owing to the absence in California of *Drosicha* (*Monophlebus*) *crawfordi*, Mask., the preferred host of the latter.

The egg is laid in the haemocoele of the host, usually during the second instar. The first three stages of the larvae are plasmophagous, absorbing food by osmosis directly from the blood of the host. The fourth stage larva is omnivorous. As many as 17 larvae may reach maturity in a single individual of *I. purchasi*, but the presence of

late-stage larvae appears to have an inhibiting effect on the development of earlier stages. The pathological effects on the tissues of the host are very slight during the plasmophagous stages. The puparium is formed within the dead body of the host. The adult is short-lived and intolerant of captivity. The process of pairing is described. The female, which lays about 200 eggs, can apparently distinguish a scale containing parasitic larvae in an advanced stage of development from an unparasitised one. A high percentage of the eggs are infertile, in one case as many as 20 per cent. All stages of *C. iceryae* are described, as well as the internal anatomy of the larva, and characters distinguishing the adult from closely allied species are given, together with a key to the known species of the genus.

With regard to the economic importance of the parasite, there are not sufficient data available to give a reliable figure for the average percentage of parasitism over the whole State. It is estimated that in the north it must amount to at least 60 per cent. In southern California the average is lower, possibly owing to the action of *Novius* (*Vedalia*) [*cardinalis*, Muls.]. Nevertheless it is of value even in this region, and in the case of isolated infestations not yet discovered by *N. cardinalis*, a parasitism of 90 per cent. is not unusual, the infestation in such cases being rapidly wiped out. There seems to be no doubt that either *N. cardinalis* or *C. iceryae* alone is capable of effectively controlling *I. purchasi*.

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Roark (R. C.). **The insecticidal Possibilities of Derris Root.** [Review of the literature.]—*Soap*, vii, no. 3, pp. 97, 99, 101. New York, N.Y., March 1931.

Kunike (G.). **Das Auftreten des Maiszünslers** (*Pyrausta nubilalis* **Hbn.**) **in Baden im Jahre 1928.** [The Occurrence of the Maize Borer (*P. nubilalis*) in Baden in 1928.]—*Arb. biol. Reichsanst. Land. u. Forstw.*, xviii, no. 4, pp. 385–403, 16 refs. Berlin, 1931. [*Cf. R.A.E.*, A, xix, 148.]

Franssen (C. J. H.). **Bijenteelt op Java en de biologie van** *Apis indica* **F.** [Apiculture in Java and the Biology of *A. indica*.]—*Natuurh. Maandbl.*, xx, nos. 3, 4 & 5, pp. 44–48, 56–64, 71–74. Maastricht, March, April & May 1931.

China (W. E.). **A new Species of** *Erythroneura* [*E. lubiae*] (**Homoptera, Jassoidea**) **injurious to French Beans** (*Phaseolus vulgaris*) **in the Sudan.**—*Bull. Ent. Res.*, xxii, pt. 1, pp. 53–54, 1 fig. London, March 1931.

Munro (H. K.). **New Trypetidae** (**Dipt.**) **from South Africa, II** [1 new genus, 5 new species and 2 new varieties].—*Bull. Ent. Res.*, xxii, pt. 1, pp. 115–126, 5 figs. London, March 1931.

Hoffmeyer (E. B.). **Beiträge zur Kenntnis der dänischen Callimomiden, mit Bestimmungstabellen der europäischen Arten** (**Hym. Chalc.**) (**Callimomidenstudien 5**). [Contribution to the Knowledge of Danish Torymids, with Keys to the European Species, including a list of food-plants and hosts.]—*Ent. Medd.*, xvii, nos. 3 & 4, pp. 232–285, 19 figs. Copenhagen, 1930 & 1931.

BONDAR (G.). **Um novo genero e tres novas especies de Thysanopteros Heliothripineos, encontrados na Bahia** [including *Heliothrips ipomoeae*, sp. n., on sweet potato].—*Arch. Inst. biol.*, iv, pp. 83–88, 1 pl. São Paulo, 1931.

KUWANA (I.). **The Diaspine Coccidae of Japan, VI. Genus** *Phenacaspis*.—*Sci. Bull. Minist. Agric. For. Japan*, no. 2, pp. 1–14, 3 pls. Tokyo, March 1931.

KUWANA (I.). **The Genus** *Kermes* **of Japan.**—*Sci. Bull. Minist. Agric. For. Japan*, no. 2, pp. 15–29, 8 pls., 5 figs. Tokyo, March 1931.

KANDA (S.). **A new Japanese Coccid** [*Phenacoccus viburni*, sp. n. on *Viburnum dilatatum*]. [*In Japanese.*]—*Insect Wld.*, xxxv, pp. 25–28. Gifu, 1931.

CARROLL (J.) & TURPIN (T.). **Control of Red Mite** [*Paratetranychus pilosus*, C. & F.] **on Apple by Winter Spraying.**—*J. Dept. Agric.* [*Ireland*], xxx, no. 1, pp. 121–127, 1 ref. Dublin, 1931. [See *R.A.E.*, A, xviii, 669.]

BONDAR (G.). **Insectos damninhos e molestias da batata doce no Brasil.** [Insect Pests and Diseases of the Sweet Potato in Brazil.]—*Correio agric.*, viii, no. 12, pp. 343–348, 2 figs. Bahia, December 1930. [See *R.A.E.*, A, xix, 14.]

MAHDIHASSAN (S.). **The first Ecdysis of the Lac Insect (Coccid.).**—*Deuts. ent. Z.*, 1930, Heft 4, pp. 223–234, 12 figs. Berlin, January 1931.

SCHEDL (K. E.). **Morphology of the Bark-beetles of the Genus** *Gnathotrichus* **Eichh.**—*Smiths. Misc. Coll.*, lxxviii, no. 10, 88 pp., 40 figs., 61 refs. Washington [D.C.], 24th January 1931.

Tierische Schädlinge (Lebensweise und Bekämpfung.). [A List of recent Papers on Animal Pests, their Life-history and Control.]—*Neuheiten Geb. PflSchutzes*, 1930, Sonderheft, pp. 6–52. Vienna, 1930.

TAKAHASHI (R.). **Some Coccidae of Formosa** [4 new species and *Lepidosaphes sacchari*, Hall (*R.A.E.*, A, xii, 196) on *Miscanthus*].—*Trans. Nat. Hist. Soc. Formosa*, xxi, no. 112, pp. 1–5, 5 figs. Taihoku, Formosa, February 1931.

METALNIKOV (S.), HERGULA (B.) & STRAIL [D.M.]. **Utilisation des microbes dans la lutte contre la pyrale du maïs** [*Pyrausta nubilalis*, Hb.].—*Ann. Inst. Pasteur*, xlvi, no. 3, pp. 320–325, 1 ref. Paris, March 1931. [*Cf. R.A.E.*, A, xix, 155.]

CHORINE (V.). **Sur l'utilisation des microbes dans la lutte contre la pyrale du maïs** [*Pyrausta nubilalis*, Hb.].—*Ann. Inst. Pasteur*, xlvi, no. 3, pp. 326–336. Paris, March 1931. [*Cf. R.A.E.*, A, xix, 150.]

MARUMO (N.). *Crambus shichito* **n. sp.** [on *Cyperus* in Japan]. [*In Japanese & English.*]—*Oyo-Dobuts. Zasshi*, iii, pp. 26–30, 1 fig. Tokyo, 1931.

RAMAKRISHNA AYYAR (T. V.) & MARGABANDHU (V.). **Notes on Indian Thysanoptera with brief Descriptions of new Species** [including *Selenothrips rubrocinctus*, Giard, on cashew nut leaves (*Anacardium*) in Trichur and Malabar].—*J. Bombay Nat. Hist. Soc.*, xxxiv, no. 4, pp. 1029–1040, 2 pls., 1 fig. Bombay, 2nd March 1931.

THOMAS (R.). **Extermination of Locusts by Aeroplane.**—*Emp. Cott. Growg. Rev.*, viii, no. 2, pp. 121–123. London, April 1931.

A brief account is given of experiments on the application of calcium arsenate dust from aeroplanes against locusts carried out in the Philippines in 1923. It was proved by comparative tests that this method, which is very effective, is more economical than any others [no figures are given]. Maximum efficiency is obtained if the dusting is done in the evening and a strip of land in front of a moving swarm of hoppers is dusted, and if the aeroplane flies slowly.

THOMPSON (M. A.). **Summary of State and Territorial Plant Quarantines affecting Interstate Shipments.**—*Misc. Pub. U.S. Dept. Agric.*, no. 80, 128 pp. Washington, D.C., July 1930. [Recd. 1931.]

This compilation is intended to serve shippers, buyers and State Quarantine officials as a synopsis of State and Territorial quarantine regulations in the United States, but should not be used independently of the regulations themselves. It deals only with specific plant quarantines and gives no information concerning the general nursery stock shipping requirements of any State, though in the case of Hawaii and Porto Rico the general requirements are given. The application of the Federal plant quarantines to these Territories is also explained in supplementary notes. State quarantines pertaining to infestations with regard to which Federal quarantines have been issued, and State regulations relating exclusively to intrastate shipments or to importations from foreign countries are omitted.

BARTON (A. J.). **La Mosca de la Fruta y nuestra Econonomía Agrícola.** [The Fruit Fly and Peruvian agricultural Economy.]—*La Vida agríc.*, viii, no. 86, pp. 29–35, 2 figs. Lima, 1st January 1931.

The fruit-fly, *Anastrepha fraterculus*, Wied., is a serious pest in Peru; in 1930 near Lima it caused an almost total loss of the crop of loquats (*Eriobotrya japonica*). The quarantine measures adopted by Chile and their bearing on the exportation of fruit and vegetables from Tacna are discussed.

CAMPOS R. (F.). **Dos insectos dañinos a las plantas.** [Two Insect Pests of Plants in Ecuador.]—*Rev. Col. nac. Vicente Rocafuerte*, xi, no. 38–39, pp. 19–23, 1 pl. Guayaquil, 1929. [Recd. 1931.]

Rhynchophorus palmarum, L., has become a very serious pest of coconut, *Guilielma speciosa*, and other palms in Ecuador. Infestation may be prevented by placing sea-salt on the heart of the palm and then adding water containing lime. This should be done before the winter, when the adult weevils appear and oviposit. *Dysdercus ruficollis*, L., *D. concinnus*, Stål, and *D. ruficeps*, Perty, attack cotton and other malvaceous plants, and are best controlled by a nicotine spray, the ground at the foot of the plants being also wetted in order to destroy the eggs.

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Bondar (G.). **Insectos damninhos e molestias dos feijões na Bahia.** [Insect Pests and Diseases of leguminous Crops in Bahia.]—*Bol. Lab. Pat. veg.*, no. 9, 111 pp., 30 figs. Bahia, 1930.

Most of the insects attacking leguminous crops dealt with here have been noticed from other papers [*R.A.E.*, A, xvi, 634, 635; xvii, 159, 319, 320, 461, 487, 617; xviii, 162; xix, 12, 13]. Others include the leaf-mining Hispids, *Anoplitis canavaliae*, Maulik, a serious pest that lays its eggs in pairs on the undersides of the leaves, *Xenochalepus ancora*, Chap., and *Octotoma tessellata*, Maulik. The larva of the Hesperiid, *Eudamus proteus*, L., rolls the edge of a leaf, feeding and pupating in the shelter thus formed. Dusting with Paris green is advised against it. The Coreid, *Crinocerus sanctus*, F., feeds on the leaves, shoots and pods of *Canavalia ensiformis*, and the Tingid, *Gargaphia lasciva*, Gibson, is a serious pest of beans (*Phaseolus*), less harm being done by another Tingid, *Tigava bondari*, Drake. *Idiopterus brasiliensis*, Moreira, is the commonest Aphid, and three Thysanoptera, *Heliothrips phaseoli*, Hood, *Thrips tabaci*, Lind., and *Frankliniella insularis*, Franklin, also occur.

Edwards (W. H.). **Pimento Scale in Manchester.**—*J. Jamaica Agric. Soc.*, xxxv, no. 3, pp. 119–123. Kingston, March 1931.

A survey of pimento trees in Jamaica, which are much damaged by the attacks of the whitefly, *Aleurodicus pimentae*, Lg., has shown that the poor state of the trees is largely due to their environmental conditions. The natural habitat of pimento is in forests, but a great deal of deforestation has been carried out and, wherever the plants have been left standing in exposed situations in bare pasture lands, their vitality is so diminished that they are very susceptible to attack by diseases and insects. On plants growing in sheltered and shaded situations, the whitefly is destroyed in large numbers by the fungus, *Aschersonia aleurodis*, and the trees are healthy and successfully resist the attacks of pests. *A. pimentae* is easily killed by contact insecticides such as oil emulsion, but, except in special cases where young trees require protection, such direct methods of control are not recommended. Effective and permanent control can only be obtained by checking systematic deforestation and improving the condition under which the trees grow.

Parrott (P. J.). **Old Spray Problems from new Angles.**—*Proc. 76th Ann. Meeting N.Y. St. Hort. Soc.*, pp. 22–31. Le Roy, N.Y., 1931.

Certain aspects of spraying against orchard pests in New York State are discussed with reference to the abnormal spring and summer climatic conditions of 1930. The problem of successful control of the apple maggot [*Rhagoletis pomonella*, Walsh] varies according to the standards of spray practices of individual growers and to the history of the orchard with reference to past treatment with approved materials. By storing fruit at a temperature of 30–33° F. for 30 days, a mortality of 99 per cent. or higher of the larvae in it has been obtained, and cold storage as a supplementary treatment to spraying is recom-

mended in the case of fruit for export. Infestation of peaches by the oriental peach moth [*Cydia molesta*, Busck] was reduced from 25 per cent. to 5–8 per cent. by certain insecticides, but the results hardly justified the expenditure. Biological control work, however, showed some progress, especially with *Macrocentrus ancylivora*, Rohw.

HARTZELL (F. Z.). **The Pear Midge.**—*Proc. 76th Ann. Meeting N. Y. St. Hort. Soc.*, pp. 189–197. Le Roy, N.Y., 1931.

An account is given of experiments carried out in 1930 in New York against *Contarinia pyrivora*, Riley, on pears. The intensity of infestation varies in different years and in different parts of an orchard. The adults emerge earlier in a warm soil and on southerly slopes. Shelter from the wind was one of the most important factors influencing the relative abundance of infested pears during the year; the wind velocity was very high when the adults were present. Experiments showed a reduction in the degree of infestation as the distance from the sheltered side of the orchard increased. Several sprays designed to kill the adults before they had oviposited, all of which contained nicotine sulphate, combined with other materials at the rate of 1 : 800, were applied on 29th or 30th April. The majority gave a high degree of control, particularly one containing 2 per cent. Volck oil, but one containing 3 lb. lead arsenate and 2 U.S. gals. molasses per 100 U.S. gals. was ineffective. No increased mortality was obtained by a second spray on 2nd or 3rd May, and this also appeared to be detrimental to the setting of fruit. The time of application is very important, as control can only be accomplished over a short period. The trunks and branches of all trees in the orchard should be sprayed, and if all cannot be sprayed together those in sheltered situations should be treated at the most opportune period, as they are likely to suffer the most damage if control is unsuccessful. If practicable, shelter trees near the edge of the orchard should also be sprayed, as these may harbour the midges and result in infestation after spraying is over.

CHAPMAN (P. J.). **The Apple Maggot.**—*Proc. 76th Ann. Meeting N. Y. St. Hort. Soc.*, pp. 201–210. Le Roy, N.Y., 1931.

The difficulty of detecting and removing fruit infested by *Rhagoletis pomonella*, Walsh, raises a serious problem in the certification of apples for export. Experiments undertaken in New York State in 1930 gave strong evidence of the value of properly timed spraying with lead arsenate, provided that the treatments are applied according to the appearance of the flies and all trees in the orchard and within 100 yards of it are thoroughly sprayed, including trees not bearing in the year of spraying. The flies are emerging for a period of about 2 months, and a week elapses between emergence and oviposition. Recommendations to growers, based on trap cage records, involved two sprays in July in one area, and three sprays, one in August, in another. The problems arising from the spray residues on the harvested fruit following thorough spraying with lead arsenate and lime-sulphur are discussed [*cf. R.A.E.*, A, xix, 356], and reference is made to the value of cold storage as a supplementary measure for killing the larvae in harvested fruit.

Walsh (G. B.). *Dermestes lardarius* **L. feeding in Wood.**—*Ent. Mon. Mag.*, lxvii, no. 800, p. 19. London, January 1931.

Richards (O. W.). **Dermestid Beetles attacking Wood.**—*T.c.*, no. 802, p. 59. London, March 1931.

Morison (G. D.). **Larva of** *Dermestes vulpinus* **F. does not feed on Wood.**—*T.c.*, no. 803, pp. 92–93. London, April 1931.

Bedwell (E. C.). **Dermestid beetles attacking Wood.**—*T.c.*, pp. 93–94.

Walsh records the finding in England of larvae, pupae and adults of *Dermestes lardarius*, L., in burrows in a packing case that had contained dry haricot beans. Richards considers that the attacks of Dermestid larvae on such vegetable substances as wood, cork, tobacco or bales of cotton are due to larvae seeking a place for pupation, and that there is no good evidence that they eat such substances. Morison gives details of rearing *D. vulpinus*, F., introduced into Aberdeen on bales of cotton rags that had become infested with beetles from hides from Argentina. The larvae did not feed on wood or cork and died if confined with them. In their efforts to find a suitable place for pupation they may bore into such substances, but at this stage they eat little or nothing. Amongst other Dermestids reared by him, the tendency to burrow into wood was not observed in *Trogoderma granarium*, Everts, *Megatoma undata*, L., or *Ctesias* (*Tiresias*) *serra*, F. Bedwell gives an instance of finding timbers of a roof in a factory hollowed out and also honeycombed. Swarms of larvae in all stages of growth and adults of *D. vulpinus* were present and also a few Clerids of the genus *Necrobia*.

Barnes (H. F.). **Notes on the Parasites of the Cabbage Aphid** (*Brevicoryne brassicae* **Linn.**).—*Ent. Mon. Mag.*, lxvii, no. 802, pp. 55–57, 1 graph. London, March 1931.

In the autumn of 1929 there was a serious outbreak of the cabbage aphis, *Brevicoryne brassicae*, L., in many parts of England, and an investigation of its parasites on one heavily infested plant was made in the summer of 1930. The Braconids, *Aphidius brassicae*, Marsh., and *A. polygoni*, Marsh., which are primary internal parasites, emerged fairly regularly from April till the end of May, when the numbers decreased till the end of June, a total of 504 individuals being obtained. In addition, large numbers (3,390) of *Charips* (*Allotria*) *longicornis*, Htg., emerged during May and June. This Cynipid is an internal parasite of *Aphidius*. The Pteromalid, *Asaphes vulgaris*, Wlk., an ectoparasite of both *Charips* and *Aphidius*, was also present, 472 individuals emerging. If *Charips* occurs in large numbers, there is more chance of *Asaphes* destroying it, but if it is less numerous, there is more chance of *Aphidius* being killed. In the case under observation the Pteromalid was probably beneficial. The result of this parasitism was that late in the season the Aphid attack was controlled in the district where these observations were made.

Richards (O. W.). *Aphomia* (*Paralispa*) *gularis* **Zeller (Galleriidae).**—*Ent. Mon. Mag.*, lxvii, no. 802, pp. 59–60. London, March 1931.

Larvae of the Pyralid, *Aphomia gularis*, Zell., were obtained in a London warehouse, infesting Algerian almonds. Records of its distribution and the products it infests are briefly reviewed from the literature.

SUIRE (J.). **Parasitisme de** *Pediculoides ventricosus* **Newp. aux dépens du couvain.**—*L'Apiculteur*, lxxiv, reprint 4 pp., 4 figs. Paris, March 1930. [Recd. April 1931.]

The mite, *Pediculoides ventricosus*, Newp., is recorded as attacking the larvae of honey bees in France, and brief notes are given on its bionomics [*cf.* *R.A.E.*, A, xiv, 564].

[GHOSH (C. C.).] **Entomology.**—*Rep. Dept. Agric. Burma 1929–30*, p. 12. Rangoon, 1931.

Pests recorded from Burma during the year ended 31st March 1930 include *Cirphis unipuncta*, Haw., *Spodoptera mauritia*, Boisd., and the Cecidomyiid, *Pachydiplosis oryzae*, Wood-Mason, on rice ; *Anomala antiqua*, Gyll., on groundnuts [*Arachis hypogaea*], cotton, etc. ; and *Agrotis ypsilon*, Hfn., on potatoes. Ants in seed beds were successfully dealt with by mixing one-fourth pint of ordinary kerosene oil with sufficient earth for about eight square feet and covering this by a layer of untreated soil in which the seed was sown.

HOFFMANN (W. E.). **A Pentatomid Pest of growing Beans in South China.**—*Peking Nat. Hist. Bull.*, v, pt. 3, pp. 25–26, 1 pl. Peping, China, March 1931.

Near Canton, the nymphs and adults of the Pentatomid, *Halyomorpha picus*, F., cause considerable damage to the flowers, leaves, stems and pods of various kinds of beans, and also feed on the flowers of *Hibiscus rosa-sinensis*, the stems of *Celosia argentea* and the fruits of *Solanum nigrum* and *Basella rubra*. The adults, which, except in rainy weather, are extremely active, are present from early April to late October. The first generation is completed before the middle of June, and there are at least four and probably six generations in a year. Eggs have been observed at the end of September and nymphs as late as the middle of October. The eggs are laid in masses of 28, on the lower surface of the leaves, and in the summer hatch in 4 or 5 days. The nymphs, which are described, mature in about 27 days. The eggs are sometimes parasitised by an unidentified Chalcid.

FINTZESCU (G. N.). **Les parasites des larves du Coléoptère** *Scolytus rugulosus* **Koch.**—*Bull. Sect. sci. Acad. roumaine*, xiii, no. 9–10, pp. 245–247. Bucharest, 1930.

Parasites obtained from larvae of *Scolytus rugulosus*, Ratz., attacking plum in Rumania were the Bethylid, *Cephalonomia hypobori*, Kieff., the Cleonymid, *Cheiropachys colon*, L., the Pteromalid, *Rhaphitelus maculatus*, Wlk., and the Braconid, *Ecphylus silesiacus*, Ratz. *C. colon* was bred from the host larvae in both spring and autumn, one generation of the Scolytid being thus attacked by two of the parasite.

[VERESHCHAGIN (B.).] **Верещагин (Б.). Pests of Vineyards observed in 1930 in Bessarabia and their Control.** [*In Russian.*]—*Bessarab. sel'skokhoz. Vestn.*, 1931, no. 4, pp. 12–14. Kishinev, April 1931.

Brief notes are given on some of the pests of vines observed in Bessarabia in 1930, all of which have been already noticed [*R.A.E.*, A, xviii, 132], except *Euxoa* (*Feltia*) *segetum*, Schiff., injuring the young growth, and *Eriophyes vitis*, Nal.

MOKRZECKI (Z.) & OGLOBLIN (A. A.). *Hadronotus howardi* **n. sp. (Microhymenopt., Proctotrupidae).** [*In English.*]—*Polsk. Pismo ent.*, x, pt. 1, pp. 1–8, 3 figs. Lemberg, 1931.

Hadronotus howardi, sp. n., a parasite of the eggs of *Porthetria* (*Ocneria*) *dispar*, L., in the Crimea, the female of which is here described, has several times been recorded in the literature under this name, hitherto a MS. one only, since 1907, when it was first discovered. On one occasion, during an outbreak of the moth, 75–85 per cent. of the eggs were parasitised by it.

KARPIŃSKI (J. J.). **Korniki (Ipidae) Puszczy Białowieskiej.** [The Bark-beetles of the Virgin Forest of Bialowies.]—*Polsk. Pismo ent.*, x, pt. 1, pp. 18–39, 1 fig., 1 pl., 8 refs. Lemberg, 1931. (With a Summary in German.)

Notes are given on a large number of Scolytids observed by the author, including 20 species that are new to the forest of Bialowies; *Ips* (*Pityogenes*) *monacensis*, Fuchs, which is new to Poland, and *I. monacensis* var. *bialowiezensis*, n., on pine; and *Carphoborus cholodkovskyi*, Spess., and *Pityophthorus morosovi*, Spess., on pine, and *P. trägårdhi*, Spess., and *Ips* (*Orthotomicus*) *starki*, Spess., on old spruce, which are new to Central Europe. Descriptions of these five species are given.

[BELANOVSKIĬ (I. D.).] **Белановский (И. Д.). On the Tachinid of the Meadow Moth,** *Tachina erucarum* **auctorum nec Rondani.**—*The Meadow Moth in 1929–1930* [*In Russian*], pp. 157–160, 6 refs. Kiev, Izd. Ukr. nauchno-issled. Inst. sakharn. Promuishl., 1931.

The author states that the Tachinid parasite of *Loxostege sticticalis*, L., recorded from the Ukraine and the Caucasus as *Tachina* (*Eutachina*) *erucarum*, Rond., is a distinct species, here described as *T. cinerascens*, sp. n. The characters distinguishing it from *T. larvarum*, L., are tabulated, and a key is given to the species of *Tachina* occurring in Central Europe.

[POPOV (S. D.).] **Попов (С. Д.). Modern Machinery for the Control of Pests and Diseases of Farm Crops.** [*In Russian.*]—*Bull. Plant Prot.*, ii, no. 1, pp. 1–75, 61 figs., 17 refs. Leningrad, 1931. (With a Summary in English.)

A detailed account is given of a number of sprayers and dusters manufactured in different parts of the world, with notes on their advantages and disadvantages.

[POPOV (S. D.).] **Попов (С. Д.). Experimental Data obtained by the Investigation of the Work of Dusters for fighting Pests and Diseases of Farm Plants.** [*In Russian.*]—*Bull. Plant Prot.*, ii, no. 1, pp. 77–113, 2 figs., 14 pls. Leningrad, 1931. (With a Summary in English.)

Four types of dusting machines are discussed in detail, and descriptions are given of a device for testing the air discharge and one for collecting the discharged insecticide during laboratory tests. The

latter is based on the passage of the dust cloud through an electromagnetic field so that the particles receive an electric charge and are then drawn into an electrically charged chamber.

[CHUGUNIN (Ya.).] Чугунин (Я.). **Data on the Ecology of** *Cydia pomonella*, **L.** [*In Russian.*]—*Sad i Ogorod*, 1929, no. 10, pp. 25–31. Moscow, 1929. [Recd. 1931.]

As a result of investigations to determine the factors responsible for the uneven distribution of the codling moth [*Cydia pomonella*, L.] in orchards in Nizhniĭ-Novgorod, it was found that apple trees that have borne fruit during the previous season, together with the sheds in which apples have been stored, act as foci of infestation, which is more severe in their vicinity than further away. On a given tree infestation is most severe in those apples that are most exposed to the sun. Of the cocoons on the trunks of the trees, 51·8 per cent. were found within about 4 ins. of the ground. The author believes this to be due to the fact that the temperature fluctuates less near the ground. Moreover, the mortality of the larvae overwintering at a height of about 4 ins. was only 25 per cent. as compared with 62 per cent. of those on the upper parts of the trunk. It was also found that 74·7 per cent. of the larvae occurred on the southern side. The percentage of larvae caught under shelter bands at a height of about 7 ins. was 60·3 as compared with 33·1 caught under bands placed higher.

[TARZHIMANOV (A. A.).] Таржиманов (А. А.). **A Grasshopper as a dangerous Pest of the Vine in the Shemakha District.** [*In Russian.*] —*Vestn. Vinogr. Vinodel. Vinotorg. S.S.S.R.*, iii, no. 2, pp. 107–112, 7 figs. Odessa, February 1931.

In 1930, *Isophya adelungi*, Stshelk., caused severe injury to vines in six localities near Baku, resulting in the loss of the entire crop over an area of about 22 acres. There is some doubt as to when this grasshopper first appeared in the district, but it is known to have caused some injury in 1927, and the damage has been gradually increasing each year. The eggs overwinter in the soil and hatch during the first half of March, the hoppers becoming adult towards the end of July. They feed at first on a variety of plants, particularly lucerne and *Inula* sp., and begin to attack the vines during mid-April. At this period they eat out the centres of the swelling buds and destroy the developing leaves, shoots and inflorescences, thus affecting not only the current year's crop, but also that of the ensuing year. Later in the season, when the leaves are attacked, the injury becomes less important, and the grasshoppers disappear from the vineyards towards mid-June.

[KHARIN (S. A.).] Харин (С. А.). **Some Facts about the Use of poisoned Baits and portable Screens in combating** *Schistocerca gregaria* **Försk.** [*In Russian.*]—*Proc. All-Union Sci. Res. Inst. Cott. Cult. Ind.*, no. 31, 28 pp., 22 figs. Tashkent, 1931. (With a Summary in English.) Price 65 *kop.*

Portable iron barriers combined with trap-pits proved to be very effective in the control of hoppers of *Schistocerca gregaria*, Forsk., in Turkmenistan, the failures being usually due to faulty technique.

The best results with baits were obtained when cottonseed meal was used, with 4–7 oz. sodium arsenite to 10 lb. meal. Baits proved successful even when used against adult locusts.

[BLAGOVESHCHENSKIĬ (D.), BOGOLYUBOVA (V. A.) & SOSEDOV (N. I.).] **Благовещенский (Д.), Боголюбова (В. А.) и Соседов (Н. И.). Physiology of Cotton infested with** *Epitetranychus*. [*In Russian.*] —*Proc. All-Union Sci. Res. Inst. Cott. Cult. Ind.*, no. 23, 21 pp., 22 refs. Tashkent, 1931. (With a Summary in English.) Price 35 *kop*.

A detailed account is given of experiments conducted during 1929, which show that infestation of cotton in Central Asia by *Tetranychus* (*Epitetranychus*) [*telarius*, L.] seriously disorganises the physiological functions of the leaves and thus generally affects the development of the plants.

[LEBEDEVA (V. A.).] **Лебедева (В. А.). An Attempt to estimate from an agricultural Point of View the Damage caused to Cotton by the Red-spider** (*Epitetranychus althaeae* **v. Hanst.**). [*In Russian.*] —[*Byull.*] *Sr.-Az. Inst. Zashch. Rast.* [*Bull. Centr. Asiat. Inst. Plant Prot.*], no. 21, 54 pp. Tashkent, January 1931. Price 1 *rub*.

A detailed account is given of field experiments carried out in 1927–29 in eastern Uzbekistan, chiefly to determine the resistance of different varieties of cotton to infestation by *Tetranychus telarius*, L. (*Epitetranychus althaeae*, v. Hanst.). Plants were artificially infested in late June or early July, when the mites were abundant in the fields. Two varieties were more resistant than the others, whereas a marked preference was shown for one variety, which also proved very susceptible. The effects of various manures on infested and uninfested plants were observed ; the author considers that infestation usually decreases the yield of the crop to such an extent that the improvement resulting from manuring is of no practical value. As regards the effect of infestation at different periods on the yield of the crop, injury before and during the formation of the buds is the most important.

[ARKHANGEL'SKIĬ (P. P.).] **Архангельский (П. П.). Data on Pests of dried Fruit in Central Asia.** [*In Russian.*]—[*Byull.*] *Sr.-Az. Inst. Zashch. Rast.* [*Bull. Centr. Asiat. Inst. Plant Prot.*], no. 22, 43 pp., 7 refs. Tashkent, January 1931. Price 1 *rub*.

An account is given of observations, carried out from 1st July till mid-September 1918 in Tadzhikistan and Uzbekistan, on the bionomics of *Plodia interpunctella*, Hb., and *Ephestia elutella*, Hb., which are the most important insects attacking dried fruit. All stages are described. They both probably have three, and possibly four, generations a year, the development of *Plodia* being completed in 40–85 days, and of *Ephestia* in 45–90. The adults of *Plodia*, which live only a few days and are negatively phototropic, are on the wing from about mid-April till mid-December. The number of eggs deposited by a female in the course of 3–4 days varied from 48 to 217 ; they are usually laid singly on the surface or in cracks of the dried

fruit. A marked variation occurs in the growth of the larvae even when living under the same conditions [*R.A.E.*, A, xvii, 239]; individuals in all the four instars have been found together although they had hatched on the same date. Besides infesting dried fruit, on which they feed under the cover of a tube-shaped web, the larvae were also found in dried vegetables and cereals. Hibernation occurs in the larval or pupal stage. Pupation usually takes place on the infested fruit.

The bionomics of *Ephestia* are similar to those of *Plodia*. In 1918 the adults were present from the end of June till late autumn; unlike those of *Plodia* they do not avoid light, though they are not strongly attracted by it. The maximum number of eggs deposited by a female was 141.

Infestation of dried fruit takes place almost exclusively in storehouses, freshly dried fruit being preferred to that of the previous year. Eggs were laid on dried apricots fumigated by burning sulphur, though less readily than on untreated ones, and the larvae were not affected by feeding on the fumigated fruit. The moths decidedly preferred to oviposit on softer, not over-dried, fruit and on whole apricots rather than on cut ones. Pears, peaches and apricots are more readily attacked than raisins.

Experiments showed that the moths can oviposit through sacks the fabric of which has meshes 0·7 mm. wide, but no eggs occurred either outside or inside a sack of more closely woven material. The moths were able to penetrate into a nailed-up box through a crack 2 mm. wide and oviposit on the fruit inside. In other boxes, the eggs were deposited on the sides of smaller cracks. Young larvae were able to pass through sacking with meshes of 0·75 mm., but not through a 0·25 mm. mesh.

Large numbers of the full-grown larvae of both moths were parasitised by *Microbracon* (*Habrobracon*) sp., which was especially active from the second half of August. The female parasites lived about a month, and the males, which do not feed, for about a week. The females often feed on the body fluids of larvae that they have paralysed, but do not usually oviposit on larvae on which they have fed. In one instance 70 eggs were deposited by one female. Usually 5–7 are laid on one host. The young larvae hatch in 24–36 hours and feed externally on the host larva for 1–1½ days. They then spin small opaque cocoons, in which they pupate after 1–2 days, the pupal stage lasting 8 days. The Ichneumonid, *Nemeritis canescens*, Grav., was present from the second half of August till the end of September where larvae of *Plodia* and *Ephestia* were found in numbers, and was reared from the pupae of both species.

Other pests of stored products observed in dried fruit were *Silvanus* (*Oryzaephilus*) *surinamensis*, L., *Tenebroides mauritanicus*, L., and *Laemophloeus testaceus*, F., which was rare.

The usual measures for preventing infestation are recommended, as well as fumigation of the storehouses with sulphur. Sulphur fumigation of dried apricots in the special cupboards used in Central Asia for smoke-drying the fruit did not affect their quality. All the larvae and pupae of *Plodia* and *Ephestia* were killed in an hour with 1 oz. sulphur to 3 cu. ft. in the case of soft fruit, or with somewhat less in very hard dry fruit. All larvae and adults of *T. mauritanicus* and *S. surinamensis* were killed with 2 oz. to 4½ cu. ft. in soft dried apricots, or with 1 oz. to 3 cu. ft. in hard fruit.

[Plotnikov (V. I.).] **Плотников (В. И.). The Increase in the Area occupied by Bands of** *Dociostaurus maroccanus*, **Thunb., and the Rate of its Control.** [*In Russian.*]—[*Byull.*] *Sr.-Az. Inst. Zashch. Rast.* [*Bull. Centr. Asiat. Res. Inst. Plant Prot.*], no. 25, 11 pp., 3 graphs, 1 ref. Tashkent, March 1931. Price 25 *kop.*

Estimates of requirements for the control of hoppers of *Dociostaurus maroccanus*, Thnb., based on the area occupied by the egg-pod deposits often prove to be too low owing to the fact that the hoppers tend gradually to occupy a much larger area. As a result, the campaign reaches its greatest intensity during the later stages of the insect. In order to counteract the natural extension of the infested area, it is necessary to apply control measures in the earlier stages at a rate exceeding that of the increase in the area covered by hoppers. A curve indicating the growth of an unchecked hopper band, based on two years' observations in Uzbekistan, is given, from which it is possible to calculate the portion of the infested area that should be cleared of hoppers on each consecutive day. It also shows that, at the temperatures at the time the observations were made, the campaign against the hoppers should be completed within 15 days after they hatch.

Filip'ev (N.). **Lepidopterologishe Notizen ix. Ein neuer Obstblüten-Schädling aus dem Ussuri-Gebiet.** [Notes on Lepidoptera ix. A new Pest of the Blossom of Fruit Trees in the Ussuri Region.]—*Ann. Mus. zool. Acad. Sci. U.R.S.S.*, xxxi (1930), no. 3–4, pp. 341–346, 8 figs., 8 refs. Leningrad, 1931.

Enarmonia (*Semasia*) *funesta*, sp. n., described from the Ussuri region, is the moth erroneously recorded by V. M. Engel'hardt as *E.* (*Steganoptycha*) *ustomaculana*, Curt. [*R.A.E.*, A, xvi, 364]. Three keys are given for distinguishing *E. funesta* and allied species, based on external characters and male and female genitalia.

Ripley (L. B.). **The Cedara Cut-worm Bait.**—*Fmg. S. Afr.*, 1931, reprint no. 15, 1 pl. Pretoria, March 1931.

Details are given of the preparation of the successful bait for cut-worms containing sodium fluoride and chopped prickly-pear that has already been noticed [*R.A.E.*, A, xiii, 39].

Gunn (D.). **Two Destructive Insects of Carnation Plants.**—*Bull. Dept. Agric. S. Afr.*, no. 94, 9 pp., 5 figs. Pretoria, 1931. Price 3*d.*

Considerable damage to carnations in South Africa is caused by *Heliothis* (*Chloridea*) *obsoleta*, F., and *Epichorista ionephela*, Meyr. [*R.A.E.*, A, xvii, 419]. The latter, much of the information on which has already been noticed [xiv, 232], lays its eggs in masses containing an average of 26, only one or two clusters being found on a plant even when the infestation is severe. The larval period lasts 33–55 days and the pupal 10–26. Five overlapping generations were reared between 20th July 1927 and 11th September 1928. The principal means of spread is undoubtedly the transport of carnation plants, which appear to be the only food-plant. In experiments, contact insecticides were not effective, but thorough weekly spraying with 1½ lb. lead arsenate to 40 gals. water reduced a severe infestation to

negligible proportions in four months. After this the plants were sprayed monthly as a precautionary measure. A dust of 1 lb. lead arsenate and 30 lb. lime gave almost as satisfactory results, but in windy weather the plants had to be watered to make the dust adhere. Dusts of Paris green and lime injured the plants. The moths are nocturnal, and as many as 120 have frequently been caught in a single night by a hurricane lamp hanging over a large receptacle containing water with a film of kerosene. These lamps attracted as many moths as a 300-candle-power petrol vapour lamp, and their use is recommended as a supplementary measure.

The eggs of *H. obsoleta* hatched in 7–9 days in winter and spring and 4–5 in the summer. They are deposited mostly on the buds, as many as 500 or more being laid by a single female. In winter and spring the larval stage lasts 30–34 days and in the hottest part of the summer 20–24. The pupal stage is passed in an earthen cell in the soil and lasts from 12 to over 16 days. Two generations were reared between August 1927 and January 1928. Spraying with lead arsenate to prevent the newly hatched larvae from burrowing into the buds proved unsatisfactory, but highly refined white oil (3 per cent.) destroyed the eggs. *Antirrhinum* was used as a trap crop ; the moths laid large numbers of eggs on the buds, which were then removed and burnt. The adults are attracted to light, though not so readily as those of *E. ionephela*. Many of the pupae may be destroyed by soil cultivation.

COMPERE (H.). **A Revision of the Genus *Diversinervus* Silvestri, Encyrtid Parasites of Coccids (Hymenoptera).**—*Univ. Calif. Pub. Ent.*, v, no. 11, pp. 233–245, 3 figs., 1 ref. Berkeley, Cal., 2nd April 1931.

The species included in this revision of *Diversinervus* (*Cheiloneuroides*) are : *D. scutatus*, sp. n., parasitic on *Ceronema* sp., and *D. meridionalis*, sp. n., on *Ceroplastes* sp., both in Natal ; *D. de santisi*, sp. n., on *Pulvinaria* sp. in Abyssinia ; *D. elegans*, Silv., brief notes on the biology of which are included ; and *D. silvestrii*, Wtrst. [*R.A.E.*, A, v, 4].

COMPERE (H.). **A Discussion of the Parasites of *Saissetia oleae* (Bern.) collected in Eritrea.**—*Univ. Calif. Pub. Ent.*, v, no. 12, pp. 247–255, 1 ref. Berkeley, Cal., 2nd April 1931.

In the course of an investigation in Eritrea to study the parasites of *Saissetia oleae*, Bern. (black scale) for the purpose of importing the effective ones into California, all those mentioned by Silvestri [*R.A.E.*, A, iii, 432] were obtained, except *Eupelmus saissetiae*, Silv., which is presumably of no economic importance, as well as ten additional species. *Baeoanusia oleae* and *B. minor*, which were described by Silvestri in *Bothriothorax*, proved to be hyperparasites, whereas *Diversinervus elegans*, Silv., which was suspected of being hyperparasitic, is primary. The most effective of the parasites attacking the black scale in Eritrea proved to be species already established in California [*cf.* xvi, 435]. It was found that, contrary to previous supposition, the rarity of *S. oleae* at Nefasit is not entirely due to parasites, and is probably partly the result of the hot and humid climate of the foothills and lowlands. On the adjacent plateau, where the

climate is cool and temperate, *S. oleae* flourishes and is subject to about the same degree of parasitism as in Nefasit, which is in a transition zone between a tropical and temperate region.

Life-history studies of *Baeoanusia oleae*, made in April 1930 at Nefasit, where it is one of the commonest hyperparasites of *S. oleae*, demonstrated that it is an obligatory parasite of *Scutellista cyanea*, Motsch., and may possibly be monoxenotic. As it has never been recorded from Cape Colony, where both the scale and its best-known parasite, *S. cyanea*, were supposed to have originated, the discovery of this highly specialised hyperparasite in Eritrea indicates that its host occurred there prior to its establishment in Cape Colony. *B. minor*, which is less common, also proved to be hyperparasitic, destroying the larvae and pupae of *Metaphycus lounsburyi*, How., probably the most important parasite of *S. oleae* occurring in Eritrea. Although reared experimentally only from this parasite, it was taken in circumstances that indicate that it may also be parasitic on *D. elegans*. A single specimen was reared from *Saissetia cuneiformis*, Leonardi, which is attacked by 5 or more parasites including *Metaphycus* sp.

Females of *D. elegans*, a primary parasite of *S. oleae*, oviposit through the anus of the Coccid, and the eggs are found in the hind intestine of the host. This parasite was found to be generally distributed, but not abundant in any one locality. Specimens indistinguishable from it have been reared in Natal, and it has been described by Girault from Queensland as *Cheiloneuroides bicristatus*.

The supposition that *Cheiloneurus obscurus*, Silv., is a hyperparasite was not demonstrated in the course of occasional rearings from *S. oleae* collected in Eritrea. *Tetrastichus injuriosus*, Comp., which is hyperparasitic on *S. oleae* as well as on other Coccids, was the most numerous hyperparasite reared. *Scutellista cyanea* was as abundant in Eritrea as in California, in spite of severe attack by *B. oleae*. *Coccophagus ochraceus*, How., was frequently reared from the small-sized black scale. Since 1921 this species has ranked among the most important parasites of *S. oleae* in California, but its sudden rise to economic value there cannot be attributed to liberations of introduced individuals [xii, 448], as it was collected in large numbers from widely separated localities almost simultaneously.

Coccophagus saintebeauvei, Gir., was very numerous in certain restricted areas, where *S. oleae* was extremely abundant on *Croton macrostachys*, but was not generally distributed. The developing larvae avoid the vital organs of the host and complete their pupal development while the host is still alive. The abundance of this species in two isolated cases can be explained by the fact that it is not uncommon for an isolated infestation of scale to become severe before being located by parasites, in which case the first parasite to appear becomes more numerous than any of the competing species that arrive later, even though they are more efficient. *C. baldassarii*, sp. n., the female of which is described, is another primary parasite of *S. oleae*. About 50 living adults reared in the laboratory readily propagated in a stock of the scale of Californian origin. Another of the primary parasites found attacking the small black scales appears indistinguishable from *Euaphycus helvolus*, Comp.

A few adults of *Coccophagus nigritus*, Comp. [xix, 263] were reared from *S. cuneiformis* collected at Nefasit. Occasional individuals appeared in jars where parasites of *S. oleae* were being reared, although, owing to the presence of individuals of *S. cuneiformis*, it cannot be positively

stated that *C. nigritus* is a parasite of *S. oleae*. Rearing records of a large series of species of *Coccophagus* allied to *C. lecanii*, Fitch, from Eritrea indicate the existence of definite host preferences, if not actual host limitations. *C. eritreaensis*, sp. n., both sexes of which are described, was only definitely reared from *S. cuneiformis* and *Coccus hesperidum*, L. If the evidence that this species is not parasitic on *S. oleae* is correct, it corroborates the suspicion that the *lecanii* group includes a number of newly evolved, closely related forms that cannot be satisfactorily recognised on the basis of the taxonomic characters now used. A few specimens of *Coccophagus eleaphilus*, Silv., a species of the *lecanii* group originally described from Nefasit, where it was bred from the Aleurodid, *Siphoninus finitimus*, Silv., were reared from cuttings infested with *Saissetia oleae*, but *S. cuneiformis* may also have been present. It is possible that the specimens identified as *C. eleaphilus* are extreme colour variants of *C. eritreaensis*.

The hyperparasite referred to elsewhere [xvi, 435] as *Euxanthellus* sp. has been identified as *E. phillippiae*, Silv., and a large number of specimens collected in Eritrea were found to be identical with those obtained in South Africa. It is one of the most injurious hyperparasites, fully as harmful as *Quaylea whittieri*, Gir., and attacking a much wider variety of hosts. Large numbers were reared from *S. oleae* in various localities in Eritrea.

RITCHIE (A. H.). **Report of the Entomologist.**—*Ann. Rep. Dept. Agric. Tanganyika Terr. 1929–30*, pt. ii, pp. 37–44. Dar-es-Salaam [1931].

In view of enquiries into the possibility of lac culture in Tanganyika Territory, it is stated that there are many suitable host trees and that the conditions are generally favourable, but that predacious Lepidopterous larvae such as *Eublemma costimacula*, Saalm., and *Spalgis lemolea*, Druce, would probably destroy many of the lac insects. Evidence supports the theory that *Antestia lineaticollis*, Stål (coffee bug) transmits the spores of *Nematospora coryli*, which causes internal rot of coffee beans. Owing to the danger of injury to the plants by sodium arsenite in the sweetened spray used against this pest, an enquiry was made into the composition of average samples, and it is suggested that manufacturers should supply an arsenite analysing 80 per cent. arsenious oxide, with a residue of 0·2 per cent. insoluble in cold water and 0·1 per cent. in hot. A Cecidomyiid larva caused sterility and fall of coffee blossoms in December 1929. No insect pests have as yet attracted notice in the new tea areas, but *Helopeltis bergrothi*, Reut., has been collected on coffee in one locality. The reduction of infestation of cotton by *Platyedra gossypiella*, Saund. (pink bollworm) to 1·7 per cent. of the locules in an area where 30–80 per cent. were infested in 1922 is attributable to the curtailment of the cotton season and the improved observance of the close season. *Apion xanthostylum*, Wagn., has almost entirely disappeared from the cotton fields owing to the improved conditions. Recent work in the United States on the application of micaceous dusts for the control of Lepidopterous larvae lends interest to the fact that in an area where the soil is highly micaceous, seed cotton passed through rotary openers (or beaters) is cleaned of a high percentage of *P. gossypiella* and larvae taken from the dusting refuse, which contains soil material, fail to develop. It has been decided that the growing of kapok (*Eriodendron anfractuosum*) in

cotton areas is permissible, as the cotton plants have been uprooted by the time kapok is shedding seed, and the consequent increase of *Dysdercus* spp. has no effect on the cotton lint. *Lyctus brunneus*, Steph., is recorded as attacking various soft timbers or the sap-wood of hard timbers. *Araecerus fasciculatus*, DeG., which was originally recorded as a field pest in 1922, attacking cacao in the pod, may also breed in coffee allowed to dry on the tree.

In addition to the three invasions of *Schistocerca gregaria*, Forsk., already noticed [*R.A.E.*, A, xviii, 422], a fourth consisting of yellow (sexually mature) locusts appeared in November 1929. All the last three swarms oviposited and anti-locust campaigns were necessary. They had to be carried out in thicket areas covered with dense rank vegetation where baits would be ineffective ; the difficulties of their organisation in such circumstances are discussed. Of the control measures against hoppers, dusts and sprays of sodium arsenite and flame throwers were extremely effective.

Laphygma exempta, Wlk., attacked young maize, *Sorghum* and native crops in late January and February practically throughout the Territory. Maize fields may be protected against the migrating larvae by trenches.

DELASSUS (M.). **Algeria : Latest Locust Invasion.**—*Int. Bull. Plant Prot.*, v, no. 5, pp. 69–74. Rome, May 1931.

An invasion of Algeria by *Schistocerca gregaria*, Forsk., began in late December 1929, and continued throughout the spring and summer of 1930, the locusts overrunning the whole country. Particulars are given of the course of the invasion in the Departments of Oran, Algiers and Constantine. According to official figures, the eggs occurred over an area of more than 465 sq. miles. Control measures were carried out rapidly and effectively, however, and the damage, which was caused mostly by the adults, was insignificant.

DE BENEDICTIS (A.). **Eritrea : Locusts** (*Schistocerca gregaria*).—*Int. Bull. Plant Prot.*, v, no. 5, p. 74. Rome, May 1931.

During February 1931, no hatching of hoppers of *Schistocerca gregaria*, Forsk., was reported in Eritrea, but several swarms were observed.

SUREYA (M.). **Turkey : Crop Pests during 1930.**—*Int. Bull. Plant Prot.*, v, no. 5, pp. 74–75. Rome, May 1931.

Cereal pests recorded are the Tineid, *Syringopais temperatella*, Led., which chiefly attacked crops that had not been well cared for, the Carabid, *Zabrus tenebrioides* Goeze (*gibbus*, F.), and the Pentatomids, *Aelia acuminata*, L., *A. rostrata*, Boh., *A. virgata*, Klug, *Eurygaster integriceps*, Put., *E. austriaca*, Schr., and varieties of the last two. The Tineid, *Phthorimaea heliopa*, Lw., did much damage to tobacco in the vicinity of Smyrna. The Tenthredinid, *Cimbex quadrimaculata humeralis*, Geoffr., and the Noctuid, *Diloba coeruleocephala*, L., occurred on apricot and almond, and *Cassida seraphina*, Ménétr., on beet. In Thrace, aniseed crops were seriously attacked by the Tineid, *Depressaria pimpinellae*, Zell., and beet by the Curculionid, *Bothynoderes* (*Cleonus*) *farinosus*, Fhs.

The Locust Problem in India.—*Proc. Bd. Agric. India, Pusa, 1929,* pp. 53–69, 73. Calcutta, Govt. India Cent. Pub. Br., 1931.

After a discussion of the locust problem in India, the Board of Agriculture recommended that special staff should be appointed to carry out investigations on control measures and to survey the permanent breeding areas of *Schistocerca gregaria*, Forsk. (desert locust) in the country, as well as to study its biology. The need for an adequate organisation for locust control in each Province was emphasised, and the organisation of an Intelligence Bureau for collecting information on locust movements was recommended.

Fletcher (T. B.). **Locusts in India.**—*Proc. Bd. Agric. India, Pusa, 1929,* pp. 124–156. Calcutta, 1931.

Existing information on *Schistocerca gregaria*, Forsk., in India and the adjoining countries is summarised. It is suggested that the appearance of swarms in India may be either due to invasions from outside, or to the formation of true migration flights in India itself, there being some evidence to show that such flights may originate in the Marwar desert. Rainfall statistics for Rajputana are included; they tend to show that when a year in which the rainfall in Rajputana is above normal is followed by a year in which rainfall is markedly deficient, the third year is one in which an outbreak of locusts is probable, and that such outbreaks occur, on the average, every seven or ten years.

Control measures practised in other countries are described, and the necessity of an efficient intelligence service is stressed.

Richards (P. B.). **Locust Problem in India.**—*Proc. Bd. Agric. India, Pusa, 1929,* pp. 161–187. Calcutta, 1931.

Until 1927 no breeding of *Schistocerca gregaria*, Forsk., had been reported in the United Provinces for fifty years. In March-April 1927, a large swarm oviposited in several areas, and the hoppers caused damage to tea. Although swarms were recorded in 1928, no breeding was observed till 1929, when hoppers hatched in seventeen districts and caused severe damage. Suggestions for a central organisation for the control of locusts are put forward, and the usual methods of control are discussed at length.

Husain (M. A.). **The Desert Locust in the Punjab.**—*Proc. Bd. Agric. India, Pusa, 1929,* pp. 187–191. Calcutta, 1931.

Since 1843 *Schistocerca gregaria*, Forsk., has invaded the Punjab eight times, and on each occasion has continued to breed in the Province for 4–6 years. The invasions usually came from Sind and Rajputana, in the sandy deserts of which the permanent breeding grounds probably occur, through the south-western corner of the Punjab; the climatic conditions in the latter Province are apparently unsuitable for permanent breeding. Little is known of the bionomics of *S. gregaria* in India, and the data as to the number of generations a year are conflicting. It appears, however, that there are two main egg-laying periods, one in February-April and the other in July-August. The control measures practised against this locust are briefly discussed, and lines for investigations of its bionomics and ecology are indicated.

COCK (S. A.). **The Webbing Spider of Citrus Trees.**—*J. Dept. Agric. Victoria*, xxix, pt. 2, pp. 83–85, 4 figs. Melbourne, February 1931.

Considerable damage is sometimes caused to *Citrus* in northern Victoria by the Drassid spider, *Lampona obscoena*, Koch, which webs the leaves and small branches into clumps so that they are unable to function and die. If infestation is severe, the whole tree may be covered with webbing. In material submitted to the biologist of the Department of Agriculture (C. French) were found a number of Hymenopterous parasites, as well as the ant, *Iridomyrmex punctatissimus*, Em., which was apparently living on the eggs of the spider. He states that owing to the conspicuous nature of the damage, infestation may be recognised in the early stages and treated by mechanical means, but in cases of advanced infestation apparently the only effective method of eradication would be to tear off and burn the webbing. This method, however, has already been employed by growers without preventing the increase of infestation. Experiments with sprays, etc., have therefore been recently carried out by D. D. Brown, whose report occupies the greater part of this paper. It includes a further account of the damage caused, in which it is pointed out that the webbed masses afford favourable shelter for the multiplication of Coccids. These are not attacked by the spiders, which only feed on winged insects caught in their webs. A number of sprays and dusts proved more or less effective if they came in contact with the spiders, the chief difficulty experienced being in first penetrating the webs. A spray of pyrethrum and kerosene proved the most effective. It had sufficient penetrative power to reach and kill the spiders in small webs, and when the large webs were torn apart all those hit were killed in a few minutes. Based on these tests, a thorough spraying towards the end of October, when most of the spiders are newly hatched, gave 80 per cent. mortality, and another about three weeks later gave effective control. The spray should be applied with a small hand-sprayer, owing to the necessity of directing it into localised areas. To prepare it, a stock emulsion of 2 pts. kerosene, 2 pts. water and 4 oz. soap is diluted with water to make 3 gals., and 1½ lbs. pyrethrum added, the whole being thoroughly mixed. The spray should be used as soon as possible after mixing. It should be applied on a cool day, as it is liable to scorch the foliage in hot weather.

LEEFMANS (S.). **Notes on three Dynastid-beetles noxious to Coconut-trees in the Netherlands Indies.** [*In Dutch.*]—*Korte Meded. Inst. PlZiekt.*, no. 15, 17 pp., 2 pls., 7 refs. Buitenzorg, 1931. (With a Summary in English.)

The adults of *Scapanes australis*, Boisd., *Chalcosoma atlas*, L., and *Papuana semistriata*, Arrow, both sexes of which are described, occasionally injure coconut palms. *S. australis* occurs in New Guinea, and appears to be common in the Dutch part of the Island, though injury to coconuts by it has only been recorded from the eastern part [*cf. R.A.E.*, A, iv, 150]. The damage is similar to that caused by *Oryctes*, one species of which, *O. centaurus*, Sternb., is known from New Guinea. *C. atlas* occurs throughout the Malayan region and has been observed to infest the flower-clusters of coconut in Celebes, attacking the flower-buds and the newly formed fruits. Whether the larva injures coconut is doubtful; it has been found in nursery-beds of *Cinchona* and in heaps of vegetable refuse. Adults of *P. semistriata* have been reported from Ceram as attacking young coconut plants, not over one year old, by

boring into the shoots at the point where they emerge from the nut below ground. It is suggested that the attack may be prevented by a cylinder of tin or bamboo placed round the plants and reaching four inches above and below ground, or by planting the seed-nut rather high in the soil.

Lopez (A. W.). **The correct Name of a Negros White Grub.**—*Sugar News*, xii, no. 5, p. 299. Manila, 1931. (Author's typescript abstract.)

An adult beetle of one of the more important white grubs of Occidental Negros, Philippine Islands, has been identified by Dr. Chapin of the U.S. Bureau of Entomology as the Melolonthid, *Stephanopholis philippinensis*, Brenske. The first stage of the grub, under laboratory conditions, averaged 79·4 out of a possible 65–94 days. The beetle is about 25 mm. long and 12 mm. wide, the outstanding character being the greyish longitudinal stripes on the elytra, which are light brown.

Kondo (T.) & Miyahara (M.). **On** *Peronea crocopepla*, **Meyr., distributed in Korea and Manchuria.** [*In Japanese.*]—*J. Plant Prot.*, xviii, pp. 227–231, 1 pl. Tokyo, 1931.

Descriptions are given of all stages of the Tortricid, *Peronea crocopepla*, Meyr., which is very injurious to peach in Manchuria.

Miyake (C.). **Food-plants of** *Ceroplastes rubens*, **Mask.** [*In Japanese.*] —*J. Plant Prot.*, xviii, pp. 250–252. Tokyo, 1931.

A list is given of 92 plants representing 40 families attacked by *Ceroplastes rubens*, Mask., in Japan.

Matsuda (M.). **Studies on** *Chrysomphalus aonidum*, **L. Supplementary Notes. 2.** [*In Japanese.*]—*Mushi*, iv, pp. 44–45. Fukuoka, 1931.

Chrysomphalus ficus, Ashm. (*aonidum*, auct.) is recorded as attacking *Pasania edulis* in Japan.

Kuwana (I.). **On** *Fiorinia proboscidaria*, **Green, attacking** *Citrus* **in the Loochoo Islands.** [*In Japanese.*]—*Yengei-No-Kenkyu*, no. 26, reprint 3 pp., 1 pl. Okitsu, Japan, 1931.

Fiorinia proboscidaria, Green, which is new to the Japanese fauna, has been found attacking the leaves and branches of *Citrus* in the Loochoo Islands. The adult female is described.

Rehn (J. A. G.). **A new Genus of Eneopterinae (Orthoptera, Gryllidae) from Hispaniola.**—*Trans. Amer. Ent. Soc.*, lvi, pp. 87–92, 1 pl. Philadelphia, Pa., 1930.

Arndt (C. H.) & Dozier (H. L.). **Le criquet Haïtien du caféier.**—*Bull. Serv. tech. Dept. Agric. Haiti*, no. 26, 16 pp., 6 figs. Port-au-Prince, March 1931.

In the first of these papers, the Gryllid, *Chremon repentinus*, gen. et sp. n., is described from Haiti. In the second, an account is given

of its bionomics, with descriptions of all stages. It is widely distributed in Haiti, ovipositing on a number of trees and native weeds and, since the introduction of coffee into the Island, has become a serious pest of that crop, which it finds suitable for oviposition. In one locality it also attacks cotton, but not to any great extent. The adults hide during the day under débris and feed at night. During the oviposition period, the females can easily be detected by the light of a lantern and captured at the moment of oviposition. The female detaches a circular piece of bark about $\frac{1}{8}$ in. in diameter and bores a small hole into the pith of the stem with the ovipositor. From 3 to 6 eggs are placed above and below this hole, the young stems that are still green and have much pith being preferred. The oviposition holes have a tendency to weaken the stems, so that they are apt to break when weighted with berries, but the most important damage results from infection by fungi that enter by the holes. A species of *Fusarium* and *Cercospora coffeicola* are the most dangerous, and when present in the main stem prevent the development of the terminal shoots, while encouraging the growth of secondary ones, which are very difficult to control. When the bushes are attacked year after year, correct pruning becomes impossible. The crickets appear to oviposit more often on coffee bushes exposed to strong sunlight than on those growing in shade. The eggs, which are generally laid from April to June, hatch in from 5 to 12 months, and the young nymphs can be found almost throughout the year, being particularly abundant from March to June. The nymphs and adults feed chiefly at night, on Coccids and other small insects. The period from hatching to the adult stage is about 80–90 days.

The most important natural enemy is a new Scelionid egg parasite here described by Dozier as *Leptoteleia arndti*, sp. n. The parasites emerge from the host eggs from February to June. The eggs of the cricket are also destroyed by a small ant and by the *Fusarium* fungus, and are sometimes killed when the bush is developing quickly, owing to the oviposition holes being closed by the formation of callus. Where coffee is grown exclusively over a large area and no other plants favourable for oviposition are allowed to grow, all infested stems should be pruned away while the unhatched eggs are in them. This frequently involves pruning before the crop is all gathered and earlier than would otherwise be desirable, and also sacrifices a considerable proportion of the next year's crop, for a number of the infested branches would produce lateral branches on which flower buds would develop ; the loss, however, would be less than that involved by allowing the crickets to multiply unhindered. Parasites should be allowed to develop and emerge from the prunings before they are burnt. It is hoped to discover a poison that will asphyxiate the eggs in the stems without damaging the delicate tissues of the plant.

Johnson (J. R.). **Enfermedades y Plagas de la Piña en la América Tropical.** [Diseases and Pests of Pineapple in Tropical America.] —*Rev. Agric. Puerto Rico*, xxvi, no. 7, pp. 4–11, 6 figs. S. Juan, P.R., January 1931.

The insects mentioned in this survey include the weevil borers, *Metamasius ritchiei*, Mshl., and *Cholus spinipes*, F. (*wattsi*, Mshl.) ; the Lepidopterous borers, *Tmolus echion*, L., and *Castnia icarus*, Cr. ; and the mealybugs, *Pseudococcus brevipes*, Ckll. (*bromeliae*, auct.) and *P. citri*, Risso.

Crosby (C. R.) & Blauvelt (W. E.). **Pear Insects and their Control.**—*Cornell Extens. Bull.*, no. 203, pp. 8–17. Ithaca, N.Y., N.Y. St. Coll. Agric., January 1931.

A brief account is given of the bionomics and control of pests of pear in New York State, of which *Psylla pyricola*, Först., is the most important. The spray programme is largely based on the measures required for its control, which start with either a cluster-bud spray of lime-sulphur [*cf. R.A.E.*, A, xii, 278] or an early spring application of lubricating oil emulsion (3 per cent. oil). The other pests dealt with are *Lygus communis*, Knight, *Cydia* (*Carpocapsa*) *pomonella*, L., *Conotrachelus crataegi*, Walsh (quince curculio), *Contarinia pyrivora*, Riley, *Taeniothrips inconsequens*, Uzel, and *Eriophyes pyri*, Pgst. (blister-mite), and the modifications of the programme that may be necessary for their control are indicated.

Fleury (A. C.). **Plant Quarantine Service.**—*Mon. Bull. California Dept. Agric.*, xviii (1929), no. 12, pp. 740–750. Sacramento, Cal., 1931.

Pests intercepted in California during 1929 included *Ceratitis capitata*, Wied., in avocados and coffee berries, *Dacus* (*Bactrocera*) *cucurbitae*, Coq., in string beans, and *Platyedra* (*Pectinophora*) *gossypiella*, Saund., in raw cotton in pillows, from Hawaii ; *Cydia* (*Laspeyresia*) *molesta*, Busck, in pears from Japan and apples from Pennsylvania ; *C.* (*L.*) *splendana*, Hb., in chestnuts from Japan and Italy ; *Curculio* (*Balaninus*) spp. in chestnuts from Japan, France, Italy and Ohio and in acorns from Germany and Japan ; *Platyedra gossypiella* in cotton bolls, and *Chilo simplex*, Butl., in rice straw from China ; *Cylas formicarius*, L., in sweet potatoes from China and Louisiana ; *Dialeurodes citri*, R. & H., on Cape jasmine [*Gardenia jasminoides*] from Louisiana and Ohio ; *Rhagoletis cingulata*, Lw., in cherries from Oregon and Washington ; *Aristotelia fragariae*, Busck, in strawberry plants from Oregon ; and *Conotrachelus nenuphar*, Hbst. (plum curculio) in peaches from Arkansas. Coccids intercepted on fruits of *Citrus* were *Pseudaonidia duplex*, Ckll., from China and Japan, and *Chrysomphalus dictyospermi*, Morg., from China, Italy, Spain, Mexico, Nicaragua and Panama.

Mackie (D. B.). **Entomological Functions.**—*Mon. Bull. California Dept. Agric.*, xviii (1929), no. 12, pp. 750–761. Sacramento, Cal., 1931.

An account is given of the occurrence of *Ceratitis capitata*, Wied. (Mediterranean fruit-fly) in Florida in 1929, and of a survey carried out in California in view of the possibility of its having been introduced into the State. The numbers of *Dialeurodes citri*, R. & H. (citrus whitefly) are being steadily reduced by an eradication campaign. Various measures were suggested to control the walnut fly, *Rhagoletis suavis completa*, Cress. [previously recorded in California as *R. juglandis*, Cress. (*R.A.E.*, A, xvii, 228, 385, 518 ; xviii, 15, 20, 201)]. Covering the ground under infested trees with paper to prevent the emergence

of the adults proved unsatisfactory and very expensive. As the pre-oviposition period of the flies lasts two weeks, experiments against them were made with nicotine sulphate dust in a carrier, which killed all the flies subjected to it. In an area where applications were made twice a week for 6 weeks no infested walnuts were found. A steam steriliser, capable of treating a quarter of a ton of infested walnuts, gave 100 per cent. mortality.

A brief account is given of the experiments carried out in conjunction with the State Plant Board of Florida to discover an improved method of fumigating incoming plant materials at maritime ports [xix, 314]. As a residue detrimental to the finished product is apparently left on almonds fumigated with carbon bisulphide when they are processed by steam for peeling, experiments were carried out with ethylene oxide [xviii, 407]. In tests with about 60 tons of almonds, the common storage pests were killed without injury to the product by 2 hours exposure to this gas at the rate of 2 lb. to 1,000 cu. ft., injected in a 27 in. vacuum in combination with carbon dioxide. Almonds that had been dipped in liquid ethylene oxide were eaten without injurious results. The gas is miscible in water and shows a tendency to become absorbed in certain compounds which impedes its diffusion; experiments with potatoes infested with tuber moth [*Phthorimaea operculella*, Zell.] showed that it will not penetrate the frass in a concentration sufficient to be lethal. No injury was noticed to the product. It apparently acts as a slow poison, the insects often taking over 48 hours to succumb.

LOCKWOOD (S.). **Field Entomology.**—*Mon. Bull. California Dept. Agric.*, xviii (1929), no. 12, pp. 761–773, 12 figs. Sacramento, Cal., 1931.

Notes are given on a large number of pests observed in California during 1929. They include: *Tetranychus telarius*, L., and *T. pacificus*, McGregor, which caused considerable damage to deciduous fruit trees; another mite, possibly *T. willamettei*, McGregor, which attacked vines during April and May; the Dynastid, *Ochrosidia pasadenae*, Csy., the larvae of which damaged turf on a golf-course; and *Blapstinus fuliginosus*, Csy., which attacked tomatos in May.

Vines have been successfully fumigated against *Erythroneura comes*, Say (grape leafhopper) by means of a tent of closely woven sacking supported on a light framework large enough to cover the new growth occurring before the end of May. Near the base of the tent a slit is cut with a self-closing flap. Experiments showed that calcium cyanide dust applied with one stroke of a bellows type duster killed the nymphs and also that the tent should be removed from the vine not later than 75 seconds after charging. The cost of one treatment was about 10*s*. an acre.

Cherry and European plane trees were damaged by *Chrysobothris mali*, Horn (western flat-headed apple borer). Control was obtained with a paste-like paint of 2½ oz. calcium cyanide dust and one liquid oz. raw linseed oil, a fairly thin layer of which was spread over the entrance holes through the bark. This also proved effective against *Cydia* (*Laspeyresia*) *cupressana*, Kearfott, infesting the cambium of cypress, when painted on the bark of infested branches.

AUSTIN (M. D.). **Control of the Apple Capsid. An Account of some Field Experiments during 1930.**—*J. Minist. Agric.*, xxxviii, no. 2, pp. 154–162. London, May 1931.

An account is given of experiments in Kent against *Plesiocoris rugicollis*, Fall. (apple Capsid) with various washes, particularly proprietary tar distillates of the Long Ashton type [*R.A.E.*, A, xvii, 673 ; xviii, 176], which were applied in February. The characteristics of the washes used are given. The results of the treatments, which are shown in tables, indicate that on some varieties of apple the washes give a commercial control of the Capsid though on some others their effect is not so good. It is suggested that a contact spray be used in the spring to supplement the winter washes.

NEWTON (H. C. F.). **Notes on some Parasites reared from Flea-beetles of the Genus** *Phyllotreta* **(Chrysomelidae).**—*Ent. Mon. Mag.*, lxvii, no. 803, pp. 82–84. London, April 1931.

These investigations were carried out in 1927 in Kent. The parasites recorded include the Braconids, *Perilitus aethiops*, Nees, and *Diospilus morosus*, Reinh., which attack *Phyllotreta nemorum*, L., in the larval stage. The larva leaves the host in the prepupal stage, pupating in a cocoon outside it. The pupal period lasts from 2–3 weeks, so that the parasites emerge about the same time as the unparasitised Halticids.

No parasites of the adult of *P. nemorum* were found, but the Braconid, *Perilitus areolatus*, Thoms., and an Ichneumonid, *Mesochorus* sp. (near *nigriceps*, Thoms., and *alpigenus*, Strobl), both of which emerged in July, were collected from cages containing *P. atra*, F., *P. cruciferae*, Goeze, *P. diademata*, Foudr., *P. consobrina*, Curt., *P. nigripes*, F., and *P. undulata*, Kutsch. Unlike *P. nemorum*, all the developmental stages of these beetles occur underground [*cf. R.A.E.*, A, xvi, 616]. *Mesochorus* is probably a hyperparasite. Nematodes were taken from larvae, pupae and adults of *P. atra*.

BENSON (R. B.). **Notes on the Habits and the Occurrences of** *Athalia* **Species in Britain.**—*Ent. Mon. Mag.*, lxvii, no. 805, pp. 134–137, 14 refs. London, June 1931.

Among the species dealt with is *Athalia colibri*, Christ, which was known to early writers as a serious pest of turnips in Britain, and also feeds on other crucifers. Even within the last few years it has been included in text-books as an injurious pest, but though it was so about a hundred years ago, its importance began to decline about 1837 with the general introduction of crop rotation. It is possible that some of the damage ascribed to it is caused by *A. glabricollis*, Thoms., the larva of which is very similar. *A. colibri* was supposed to have at least 3 broods (May-June, July-August, and September), with sometimes a fourth brood in October. As a native insect it has been practically absent for the last 30 years, and only 4 records of its occurrence in England are known to the author since 1900, all being prior to 1914.

FAVARD (P. G.). **La chenille bourrue de la vigne.**—*Prog. agric. vitic.*, xcv, no. 18, pp. 419–421. Montpellier, 3rd May 1931.

Arctia caja, L., is recorded as attacking vines in Hérault. It would appear from recent breeding experiments that there is only one genera-

tion a year, though adults are present from May until July or even August. The eggs, which are usually laid towards the end of May and in June, hatch in the autumn, and the larvae hibernate in various forms of shelter and reappear in the spring. Feeding is most intense at the end of April, when they are about to moult for the fourth time. They normally occur on various low-growing plants, but in the absence of other food-plants cause considerable injury to vines. At the end of April or beginning of May they pupate in loose cocoons in sheltered situations. The pupal period lasts 3–4 weeks.

A. caja is parasitised by the Braconids, *Rhogas geniculator*, Nees, and *Ascogaster rufidens*, Wesm., the Pteromalid, *Diglochis omnivora*, Wlk., and various polyphagous Ichneumonids. Measures suggested for its control include collection of the larvae, the use of low-growing plants to attract them, and arsenical sprays.

PUSSARD (R.). **Les anthonomes du poirier dans la région lyonnaise.**—*C.R. Acad. Agric. Fr.*, xvii, no. 11, pp. 465–470. Paris, 1931.

An account is given of the bionomics of *Anthonomus pomorum*, L., *A. cinctus*, Redt., and *A. spilotus*, Redt., as occurring on pears in the Lyons region [*cf. R.A.E.*, A, xviii, 515]. Only the two last-named are of any importance as pests of pears. The adults of *A. cinctus*, which emerge from the pupae in late April and throughout May, attack the terminal buds, the young stems, the young leaves before they have unrolled and the petioles of the leaves. About mid-June, feeding ceases and the weevils begin to aestivate, becoming active again at the end of September.

Of several sprays applied in mid-March against *A. spilotus*, only two tar distillates at 8 per cent. strength gave good results, the treated trees showing no punctures, either for feeding or oviposition. As the adults after hibernation feed within the tissues, arsenical sprays are then ineffective against them, but after their emergence in June they feed for a short time on the surface of the leaves before aestivating. Adults placed on leaves previously dipped in Bordeaux mixture containing calcium arsenate (20 per cent. arsenic pentoxide) at the rate of 1 lb. to 20 gals. were all dead within 5 or 6 days. The indications are that a winter treatment just before the buds open would drive away, if not destroy, the females, and that the last arsenical treatment against *Cydia* (*Laspeyresia*) *pomonella*, L., should kill the newly-emerged adults, provided that the foliage is covered with spray applied under high pressure.

BRUNETEAU (J.). **Les teignes des vêtements.**—*Rev. Zool. agric.*, xxix, no. 10, pp. 149–159, 1 pl., 1 fig., 29 refs. Bordeaux, October 1930. [Recd. 1931.]

An account is given of the bionomics and control of the clothes moths, *Tineola bisselliella*, Hum., *Tinea pellionella*, L., and *Trichophaga tapetzella*, L., both preventive and remedial measures being discussed, with notes on insecticides tested by the author against *T. tapetzella* at 22° C. [71·6° F.]. Of these, apart from carbon bisulphide, chloropicrin and hydrocyanic acid, fresh pyrethrum powder and naphthalene were very effective, all eggs, larvae and adults being killed in 24 hours by heavy dusting with the former and by the latter at the rate of about 4 oz. to 10 cu. ft.

HORVATH (G.). **La première capture de** *Ceresa bubalus* **F., en Europe.** —*Bull. Soc. ent. Fr.*, 1931, no. 6, p. 92. Paris, 1931.

With reference to recent records of the Membracid, *Ceresa bubalus*, F., in France [*R.A.E.*, A, xix, 178], the author points out that he had recorded its capture in Hungary in 1912.

RIPPER (W.). **Ueber blattminierende Tenthrediniden-Larven an Birken.** [On Leaf-mining Tenthredinid Larvae on Birch.]—*Z. PflKrankh.*, xli, no. 4, pp. 182–191, 10 figs., 7 refs. Stuttgart, 1931.

Notes are given on the bionomics and larval morphology of the leaf-mining sawflies, *Phyllotoma nemorata*, Fall., *Scolioneura* sp., *S. betuleti*, Klug (*betulae*, Zadd.) and *Fenusa pumila*, Klug, which were observed on birches in Austria, with a key to the larvae, based partly on the injury they cause. The larvae hibernate in the fallen leaves, pupating in spring. It is suggested that the fallen leaves should be burnt or used for stable litter. Before this litter is used for manure, it should be placed in compost heaps until the larvae are killed by the heat.

PROFFT (E.). **Untersuchungen über Obstbaumkarbolineen. a) Chemischer Teil.** [Investigations on Fruit-tree Carbolineums. a) Chemical Part.]—*Zbl. Bakt.* (2) lxxxiii, no. 8–14, pp. 127–135, 12 refs. Jena, 16th March 1931.

GOETZE (G.). **Untersuchungen über Obstbaumkarbolineen. b) Physiologischer Teil.** [Investigations on Fruit Tree Carbolineums. b) Physiological Part.]—*T.c.*, pp. 136–164, 1 fig., 27 refs.

The results of examinations of and experiments with a number of brands of carbolineum are set out in detail. As regards chemical composition, a satisfactory carbolineum should have as small a water-content as possible. Hydrocarbon fractions are of value only if boiling at 200° C. or over ; such fractions must make up at least 50 per cent. of the carbolineum. The desirable fractions are those boiling above 250° C., as they have the best insecticidal value without injuring the plants at suitable concentrations. A certain amount (up to 5 per cent.) of organic bases appears useful, as they are effective insecticides and beneficial to the plants. Phenols (tar acids) are not harmful if not present in excessive amount, but there is a greater risk of an excess with them. A phenol content of 15 per cent. may be accepted, and some carbolineums may contain 20 per cent. without serious harm resulting. The question of phenols and their derivates needs further investigation. The naphthalene content plays no physiological part, but it should be small, as the naphthalene easily crystalises out in frosty weather and thus interferes with spraying. Mineral substances never exceed 3·5 per cent. and are unimportant.

As regards the effect on plants, special care is needed in testing the concentrations. The gooseberry is excellent for the purpose, and at least five different percentages (5, 10, 12, 15, and 20) should each be applied to one half of each of a number of bushes, the other halves serving as controls. The young adults of *Calandra granaria*, L., have proved very suitable for tests of the insecticidal power of carbolineum as a contact poison. It is not considered necessary to experiment with the actual pest to be combated.

SPIELBERG (—). **Fragen zu Engerlingsschäden.** [Questions relating to Injury by Melolonthid Larvae.]—*Deuts. Forstw.*, 1929, pp. 782–783. (Abstract in *Zbl. Bakt.* (2) lxxxiii, no. 8–14, p. 272. Jena, 16th March 1931.)

In the spring of 1926, one-year-old pines were planted on about 300 acres of various soils in North Germany, and the plants throve until attacked by the larvae of *Melolontha melolontha*, *L.* (*vulgaris*, F.), which, however, were entirely absent in places where white mustard had been the previous crop.

BÖRNER (C.). **Mitteilungen über Blattläuse.** [Communications on Aphids.]—*Anz. Schädlingsk.*, vii, no. 3, pp. 28–30. Berlin, March 1931.

The Aphids dealt with in this part of a series already noticed [*R.A.E.*, A. xix, 378] include two new species of *Chaitophorus* from Central Europe. The identity of *Aphis avenae*, F., is discussed. The author considers it to be referable to *Amphorophora* and to be the species that Theobald described as *Macrosiphum granarium*, Kby. The author has observed this Aphid in Lorraine on rose and blackberry. As the black cherry aphis recorded as *Myzus cerasi*, F., in the United States has been observed on *Lepidium* and *Nasturtium* (watercress) [vi, 416, 441], it is probably distinct from the true *M. cerasi* of Europe. The latter itself is thought to include two species or biological races occurring on sour and sweet cherry, respectively.

GÖRNITZ (K.). **Feststellung von Parasitenlarven in den Puppen des Kiefernspanners.** [The Detection of Parasite Larvae in the Pupae of the Pine Moth.]—*Anz. Schädlingsk.*, vii, no. 3, pp. 30–33, 1 fig., 6 refs. Berlin, March 1931.

The presence of the larvae of *Ichneumon nigritarius*, Grav., in pupae of the pine moth [*Bupalus piniarius*, L.] can be detected by examining the pupae by transmitted light, but this method is unsuccessful with other parasites. Of recent years the Ichneumonids, *Heteropelma calcator*, Grav., and *Anomalon biguttatum*, Grav., and the Tachinids, *Lydella nigripes*, Fall., and *Carcelia rutilla*, B. & B., have often been more numerous than *I. nigritarius* in North Germany, and pupae parasitised by these are for a long time indistinguishable from unparasitised ones. A method of ascertaining their presence is described. The pupae are left for a night in a drying cupboard at 50–60° C. [122–140° F.] and are then cut longitudinally and put in a 10 per cent. solution of caustic potash in a test tube. Five minutes actual boiling in a water-bath saponifies the fatty portions of the pupa. The contents of the tube are then poured into a glass dish and rinsed, the parasites being then easily visible against a dark background. They can be stained by adding 0·025 per cent. of aniline blue to the caustic potash solution.

ECKSTEIN (K.). **Zur Frage: Ist der Apfelblütenstecher schädlich?** [On the Question: Is the Apple Blossom Weevil injurious?]—*NachrBl. deuts. PflSchDienst*, xi, no. 4, pp. 25–26, 5 figs. Berlin, April 1931.

Referring to Klemm's conclusions that *Anthonomus pomorum*, L., does no economic injury [*R.A.E.*, A, xix, 248], the author quotes a

statement he made in 1910 pointing out that this weevil is actually beneficial in that it thins out the apple blossoms.

RIGGERT (E.). **Ueber die Flughöhe der Fritfliege.** [On the Height of Flight of the Frit Fly.]—*NachrBl. deuts. PflSchDienst*, xi, no. 4, pp. 26–27. Berlin, April 1931.

Experiments, in which screens coated with adhesives were fixed at various heights above the ground, show that *Oscinella* (*Oscinis*) *frit*, L., flies, at least in calm weather, at heights of up to about 60 ft. The flies are uniformly distributed up to about 16 ft., and then gradually decrease in numbers, but are still surprisingly plentiful between 33 and 60 ft. It is therefore considered improbable that strips of trap crops round cereal fields can protect them.

[DRYENSKI (P.).] **Дрѣнски (П.). Ueber die Biologie des Wiesenzünslers**—*Loxostege* (*Phlyctaenodes*) *sticticalis* **L. in Bulgarien während der Jahre 1929-1930.** [*In Bulgarian.*]—*Mitt. bulgar. ent. Ges.*, vi, pp. 31–48, 8 refs. Sofia, 1931. (With a Summary in German.)

This is an account of further investigations on *Loxostege sticticalis*, L., in Bulgaria [*cf. R.A.E.*, A, xviii, 226]. In October 1929 many of the full-grown larvae of the third generation were killed by a bacterial disease and some by parasites [*cf.* xviii, 227], but in the insectary the majority of the latter did not emerge until the following May. In March 1930, examination of cocoons taken in the field showed that a few of the larvae had pupated. Some of the cocoons contained the pupae of parasites, but a considerable percentage were quite empty, the larvae having apparently abandoned them. As a result of the high rate of mortality amongst the larvae of the third generation, *L. sticticalis* only occurred in small numbers in 1930. In Bulgaria, outbreaks occur periodically every 7–10 years, and only last one year. The usual control measures are recommended.

[LAZAROV (A. V.).] **Лазаров (А. В.). Untersuchungen über die Biologie des Erbsenkäfers** *Laria* (*Bruchus*) *pisi* **L. und seine Beschädigungen.** [Investigations on the Biology of the Pea Bruchid and the Damage it causes.] [*In Bulgarian.*]—*Mitt. bulgar. ent. Ges.*, vi, pp. 98–114, 3 figs., 29 refs. Sofia, 1931. (With a Summary in German.)

Bruchus pisorum, L. (*Laria pisi*, L.), all stages of which are described, is a widely distributed and very serious pest of peas in Bulgaria. A detailed account of its bionomics is given, the information being very similar to that already noticed from the Ukraine [*R.A.E.*, A, xvi, 219]. The larval and pupal stages last about six and two weeks, respectively. Most of the adults abandon the infested peas in the autumn and hibernate in cracks in store rooms or in the field in various sheltered places. In the laboratory only 20 per cent. of the beetles remained in the seeds for the winter. Of the numerous varieties of peas examined in 1929 and 1930, 80–96 per cent. were infested. The consumption of peas contaminated by infestation caused intestinal inflammation in man and some domestic animals, though poultry were not affected. The only parasite observed was a Braconid reared from the larvae.

[Stoĭnov (P. N.).] **Стойнов (П. Н.). Der Traubenwickler** (*Polychrosis botrana* **Schiff.) in Bulgarien während 1930 und die Massnahmen für seine Bekämpfung.** [The Vine Roller (*P. botrana*) in Bulgaria during 1930 and Measures for its Control.] [*In Bulgarian.*]—*Mitt. bulgar. ent. Ges.*, vi, pp. 115–122, 1 ref. Sofia, 1931.

Recent investigations in Bulgaria have shown that *Polychrosis botrana*, Schiff., which is an important pest of vines in the southern districts, has now become established in the north as well. In 1930, however, it was only present in limited numbers throughout the country, probably owing to various parasites, which were able to survive the mild winter, and to fungous diseases among the hibernating pupae, which were favoured by the damp autumn and spring and the custom of covering the vines with earth to protect them in the winter. Of the overwintered pupae obtained from two localities, 60–63 per cent. were destroyed by fungi and 13–21 per cent. by Chalcids. During the summer *P. botrana* was also attacked by Chalcids and preyed upon by *Chrysopa* spp. The flight periods of the adults occurred in April-May, July and September.

In field experiments, the results of which are given in a table, against the larvae of the first generation and the newly hatched ones of the second, various sprays and dusts, most of which were proprietary, were applied on 16th May, 2nd June and 16th July. Examination of the treated plants on 2nd September showed that a spray of 0·15 per cent. Paris green was the most effective.

[Dryenski (P.).] **Дрѣнски (П.). Pests of the Alibotush Tea**—*Siderites scardica.* [*In Bulgarian.*]—*Mitt. bulgar. ent. Ges.*, vi, pp. 139–141, 1 fig. Sofia, 1931.

Observations were carried out in Sofia in 1930 on the Trypetid, *Aciura coryli*, Rossi, which was abundant on plants of *Siderites scardica* that had recently been obtained from the Ali-Botush mountain in south-western Bulgaria, where the dried flowers and leaves are used as a substitute for tea. The duration of the life-cycle largely depends on the temperature, but averages 46–50 days; all stages, which are briefly described, may occur at the same time. Hibernation takes place in the soil in the pupal stage. The males die soon after pairing and the females after 12–15 days. Each inflorescence harbours only one larva, which feeds on the ovaries of the flowers. The damage caused was, however, not very serious, and the bushes were able to produce new inflorescences. The larvae were attacked by a Torymid, probably *Dimeromicrus longicauda*, Masi, and a Pteromalid, *Habrocytus* sp.

Larvae of a Pterophorid, *Alucita xanthodactyla*, Tr., were also observed feeding on the inflorescences.

[Chorbadzhiev (P.).] **Чорбаджиев (П.). Notizen über die schädlichen Insekten Fauna in Bulgarien während des Jahres 1930.** [Notes on Insect Pests in Bulgaria during the Year 1930.] [*In Bulgarian.*]—*Mitt. bulgar. ent. Ges.*, vi, pp. 179–188, 2 refs. Sofia, 1931.

Various insect pests, the majority of which have already been recorded [*R.A.E.*, A, xvii, 253], were abundant in Bulgaria in 1930,

owing to the very mild winter followed by a moderately damp spring. Outbreaks of *Dociostaurus maroccanus*, Thnb., occurred in a number of districts. *Heliothis obsoleta*, F. (*armigera*, Hb.) caused considerable damage to the ears of maize, 10–20 per cent. of the plants being infested in some localities. *Pyrausta nubilalis*, Hb., did not cause appreciable damage ; parasites observed, besides those already noticed [xviii, 225], were *Eulimneria* (*Limnerium*) *alkae*, Ell. & Sacht., and *Eulophus viridulus*, Thoms. *Agrilus communis mokrzeckii*, Obenb., was abundant on roses. *Entomoscelis adonidis*, Pall., the larvae of which occurred on rape as early as the end of February, damaged 20–60 per cent. of the crop ; in laboratory experiments, all the larvae were killed in 48 hours with 0·2 per cent. Paris green, 5 per cent. barium chloride, or 1 per cent. copper arsenate. *Haltica quercetorum*, Foudr., caused serious injury to oak trees. Hibernation takes place in the adult stage in cracks of the bark, and the eggs are laid on the lower surface of the leaves, which the larvae skeletonise. Pupation occurs about mid-July under the fallen leaves, and the young beetles appear in late July and August. They feed on the foliage for some time. *Bothynoderes* (*Cleonus*) *punctiventris*, Germ., which is an important pest of beet seedlings, attacking them in late April and early May, occurred chiefly in northern Bulgaria. *Hypera* (*Phytonomus*) *variabilis*, Hbst., and *Phytodecta fornicata*, Brügg., were recorded from many localities, both causing severe damage to lucerne, on which, however, *Plagionotus floralis*, Pall., was much less numerous than in 1929 [xviii, 225]. *Physokermes* sp. infested roses ; it was attacked by the larvae of *Anthribus fasciatus*, Forst., which pupate under the scale, and by a Chalcid parasite, the adults of which emerged in the second half of March. *Lecanium corni*, Bch., was more abundant than in 1929, but was parasitised by a Chalcid.

[Stoĭnov (P.) & Chepishev (V.).] **Стойнов (П.) и Чепишев (В.). The Plum Scale *Lecanium corni* Bch. and Experiments with a few chemical Measures for its Control.** [*In Bulgarian.*]—*Mitt. bulgar. ent. Ges.*, vi, pp. 203–206. Sofia, 1931.

Lecanium corni, Bch., all stages of which are briefly described, is causing severe damage to plums in two districts in western Bulgaria, its rapid spread being favoured by the neglected condition of the orchards and the close planting of the trees. The usual control measures are recommended, including improved cultivation of the orchards ; removal of loose bark in the autumn, followed by whitewashing of the trees with a mixture of lime and carbolineum, 1 : 4–5 ; and the application of dormant sprays. A table is given showing the results of laboratory tests of various proprietary insecticides ; three tar distillates gave a 100 per cent. mortality.

Rozsypal (J.). **The Sugar-beet Pest, *Bothynoderes punctiventris* Germ., and its natural Enemies.** [*In Czech.*]—*Bull. Ecole sup. Agron. Brno*, C 16, 92 pp., 41 figs., 168 refs. Brünn, 1930. (With a Summary in English.)

Bothynoderes punctiventris, Germ., all stages of which are described, is the chief pest of sugar-beet in Czechoslovakia. It has one generation a year and hibernates in the soil, the adults, pupae and, to a less extent, larvae usually occurring at a depth of 10 ins., although they

may be found as deep as 20. The time of appearance of the adults in the field depends on the temperature in spring and the depth at which hibernation occurs. In 1923 the first weevils appeared in the first half of March, and in 1924 in early April. In 1923 weevils continued to emerge from the soil until mid-August and in 1924 until mid-June. Most of them, however, appear in the middle of May, when they migrate to new beet plantations and pair. The females are not as common as the males until May, but during the summer they become more numerous, owing to the fact that the males die soon after pairing. The adults feed on the leaves of seedling beets. Oviposition chiefly occurs at the end of May and beginning of June, the eggs being laid singly in the soil at the rate of 3–5 a day at a depth of up to 1 in. close to the beet plants, which at that time have 6–8 leaves. A female may deposit a total of 70–80 eggs. The larvae hatch on the third day and feed for about three months on the roots of the beet, the chief damage being caused to the lower part. Full-grown larvae are most numerous at the end of August.

Emergence of the weevils in fields that had been used for beet two years before, which led to the suggestion that the life-cycle of *B. punctiventris* requires two years, is tentatively explained by the author as being due to exceptional cases in which young larvae that have hatched from eggs deposited late remain in the soil in the tips of roots that are broken off during the digging up of the crop. Such larvae probably mature and pupate in the following season, and the adults emerge in the third year. Cold weather may also retard the appearance of the weevils until the third year, especially in the case of the individuals that hibernate deep in the soil.

Prior to carrying out any control measures, the soil should be examined in autumn and counts made of the hibernating weevils in a given area. To check the migration of the weevils in spring before they begin to fly, trenches, 6 ins. wide and 12 ins. deep, should be dug round beet fields of the previous year and new plantings. They should have steep, smooth sides, with pits at the bottom at intervals. Other measures recommended are digging trap holes in infested fields, hand-picking the weevils, and letting turkeys run in the fields. Of the several insecticides tested, a 4 per cent. spray of barium chloride was the best ; in the case of older plants the concentration may be increased by 1–2 per cent. It should be applied when the weevils first appear in large numbers.

The chief natural enemies of *B. punctiventris* are fungi and bacteria, though the adults are destroyed by the predacious beetle, *Hister fimetarius*, Hbst., and various birds. A severe outbreak that occurred in 1923–24 was brought to a close by the spread among the adults, pupae and larvae of various micro-organisms, of which *Beauveria bassiana* was the most important. The history of the use of this fungus against various pests, and the numerous hosts attacked by it, are reviewed from the literature. The adults and larvae of *Bothynoderes* became infected *per os* and probably also by direct contact with soil containing spores. The weevils that have suspended feeding on cold and rainy days easily succumb to the infection, the inaction of the intestinal tract being especially favourable to the development of the spores. Other fungi, which mummify the larvae, pupae and adults of *B. punctiventris*, are discussed, and an account is given of the development of all the species observed and their rearing on artificial media.

In some places the larvae of *B. punctiventris* were destroyed by a species of *Micrococcus* ; its characters and the symptoms it causes are discussed. The micrococci seem to be specific to certain soils. Larvae of *B. punctiventris* in the soil of experimental pots, and those of *Tenebrio molitor*, L., in crushed grain were successfully infected by the introduction of a pure culture and an emulsion of *Micrococcus* respectively, while larvae of *Oryctes nasicornis*, L., were killed by inoculation of the bacteria, and those of *Amphimallus* (*Rhizotrogus*) *solstitialis*, L., by being fed on the emulsion.

The literature on the utilisation of entomogenous fungi for insect control is reviewed, and a detailed account is given of laboratory experiments on the infection of different pests with *B. bassiana*. Larvae of *Pieris rapae*, L., fed on infested cabbage leaves, were immune, whereas the larvae and pupae of their parasite, *Apanteles glomeratus*, L., became heavily infested. The author believes this to be due to a peculiarity of the saliva of *P. rapae*, which is probably unfavourable to the spores. Culture experiments showed that a minimum temperature of 10° C. [50° F.] and a medium of neutral reaction provided with sufficient oxygen were necessary for the development of the fungus. The structure of the soil should be such as to allow it to grow through. It readily developed on slices of potato, but did not grow on sawdust or wood-shavings moistened with a nutritive liquid, nor on animal manure, which, therefore, cannot be used as a means of infecting the hibernating weevils, though they readily bury themselves in it in autumn. By growing the fungus on potato it is possible to produce a great quantity of virulent spores as infective material.

Other weevils observed on beet in Czechoslovakia, in order of their abundance, were *Cleonus piger*, Scop., *Hypera* (*Phytonomus*) *punctata*, F., *Pseudocleonus cinereus*, Schr., *Brachyderes incanus*, L., *Otiorrhynchus orbicularis*, Hbst., *Chromoderus fasciatus*, Müll. ; *Cyphocleonus tigrinus*, Panz., *Lepyrus capucinus*, Schall., *Sphenophorus striatopunctatus*, Goeze, *Psalidium maxillosum*, F., *Mecaspis alternans*, Hbst., and *Lixus ascanii*, L.

[The Effect of various Dusts and Sprays on certain Trees and Plants.]—*Mon. Bull. Dept. Agric. California*, xx, no. 2, pp. 167–188, 1 fig. Sacramento, Cal., February 1931.

A series of papers by different authors is noticed under this title.

A certain amount of scorching, following a considerable expansion in sulphur treatment of *Citrus* in central California in 1929, which developed in conjunction with exceedingly hot weather after heavy rain about 20th June, is recorded by E. A. McGregor. Maximum temperatures varied from 101 to 117° F. Types of injury caused to *Citrus* by sulphur scorching, which vary according to the growth of the fruit, are described; there is a difficulty in distinguishing them from ordinary sun-burn or injury from lime-sulphur. The actual loss was estimated shortly after the damage was caused at not more than 6 per cent., and in most cases below 2 per cent. At harvest a marked decrease in this percentage was observed, indicating that many of the scorched fruits had dropped, although numbers had remained on the trees and matured. Under given maximum temperatures, lime-sulphur spray is considerably more dangerous to oranges than sulphur dust, so that growers can dust at higher temperatures than they can safely spray. Hardly any damage is caused by sulphur dust to the

foliage of *Citrus*, only the old and weak leaves being susceptible to injury. In 1930, when the amount of sulphur applied to a tree was reduced and dusting was discontinued at the end of May, little scorching occurred.

L. Smith records that one week after application to a pear orchard of sulphur at the rate of 30 lb. to the acre on 30th June 1930, the young growing terminals of the trees were quite black for a distance of 4–6 ins. from the tip, the leaves falling off and the bark being blackened. A month later, when the blackened bark cracked, uninjured bark was visible beneath, indicating that the shoots would recover in the following year. No injury resulted from the application of 2 per cent. oil one month after the pears were treated with sulphur. In some cases the fruits recovered from scorching by sulphur, which appeared to be in the nature of pigmentation rather than killing of the skin, but if the skin eventually becomes cracked or sloughed no recovery is possible.

E. R. de Ong states that whereas it is commonly known that sulphur scorches grape vines at 100° F. and over, this does not necessarily hold for deciduous trees, which are generally higher off the ground. A sudden rise in temperature from an average of 70–75° F. to 100–110° F. immediately after a number of showers in the middle of June resulted in scorching on foliage and fruit, although only in two instances did the injury amount to as much as 10–15 per cent. No instance of scorching almonds has been observed, but prunes appear to be more susceptible. At lower temperatures, such as 85–90° F., no injury is caused, except to such susceptible plants as strawberries.

T. D. Urbahns discusses the factors bearing upon the effect of lime-sulphur sprays on deciduous fruit trees. In late autumn spraying of peaches, severe scorching often follows applications in a strong wind, which dries out the twigs so that when the spray is applied the bark absorbs the lime-sulphur. Horizontal limbs frequently have very heavy drops of lime-sulphur solution hanging on them, which will scorch the bark and frequently girdle it. It is preferable to avoid spraying within a day or so after severe north winds, and a time should be selected when there has been sufficient rain to give the twigs a reasonable amount of moisture. More scorching occurs, however, when spraying is done in the early morning when there is a general dampness, or in the evening when the dew begins to settle, than in the middle of the day when the sun is shining. The injury caused varies greatly with the structure of the tree. Pear trees, which are much less susceptible than peach, do not usually suffer from autumn applications if moisture conditions are reasonable. When it is beginning to become dormant and to lose its foliage, peach is not scorched so readily as a little later in the autumn. In spring it can be safely sprayed with lime-sulphur up to the time of the opening of the fruit buds, except after severe drying winds. The difference in structure between the fruit buds of peach and pear is pointed out. On pear, lime-sulphur may be used at the rate of 10 gals. in 100 gals. water while the fruit bud is swelling, but when the individual blossoms are beginning to appear such applications are liable to cause scorching.

Susceptibility of foliage to summer spraying is also very varied. On almond 2½ gals. lime-sulphur to 100 gals. water can be used with little injury, but anything over 1½ gals. will cause damage to French prunes, and 1 gal. is the maximum that can be used with safety on peach. Pear foliage is even more susceptible than peach to summer

spraying if the weather is hot. Spraying of apricots in spring when the blossoms were pink caused late and irregular ripening of the fruit, although autumn and dormant spraying caused no injury. In summer, temperature is probably the most important factor in causing sulphur injury, whereas in winter wind and possibly excessive humidity are more important. The injury caused by lime-sulphur collecting in large drops on the limbs and leaves could probably be obviated by the addition of a spreader.

Recent developments in the constitution of oil sprays are discussed by E. R. de Ong [*cf.* *R.A.E.*, A, xviii, 302]. He describes an experiment in dormant spraying with oils that confirms much field data in indicating the danger of spraying trees with either oils or lime-sulphur when they are suffering from drought, which may be temporary, following two or three days of north wind even though there is a fair amount of moisture in the soil, or which may be a condition of the soil itself. In both cases it implies that the tree is at or past the wilting stage, in which condition oil sprays or lime-sulphur are dangerous. The tendency to use increasingly high grades of oil is considered sound, and the more nearly the oil approaches to the summer type, the greater the margin of safety. The possibility of danger is greatly increased where partly refined oils are applied to trees beginning to grow in the spring. Field observations indicate that spraying at the end of November or early in December is almost certain to result in a dangerous condition of the trees in the spring, whereas sprays applied during the middle or later part of December usually show no effect at blooming time. Sprays applied during January and early February tend to hasten blooming, and those applied in late February and March incline to retard the growth of the trees.

It is pointed out that considerable changes in the viscosity of oils, as indicated by readings taken at 100° F., are liable to occur when the oils are used at temperatures considerably above or below this temperature, the variation being 150 or 175 per cent. over normal field ranges.

After a discussion of the effect of oils applied in the dormant period in stimulating or retarding the growth of trees, A. C. Browne deals with the effect of summer oil on various deciduous trees. When transpiring foliage is reduced to a wilting point by low humidity and inadequate soil moisture, oils will enter the plant tissue and even pass into the cell structure. If the oils are of relatively low sulphonation, toxic elements responsible for plant injury will thus be introduced. The general manifestation of this injury is a decided darkening of the leaf, with irregular areas of tissue becoming yellowish, or even the entire leaf turning this colour and dropping. Oil-saturated leaves may become so impregnated as to be translucent and still remain upon the tree until the autumn provided that the oil is one of complete saturation, but this condition is far from normal, and in the case of a whole tree would probably have serious after-effects.

Since the processes of making lubricating oils safe for foliage are those that remove sulphur and certain other compounds, neutral oils after treatment are capable of dissolving varying amounts of sulphur or sulphur compounds, and for this reason the use of sulphur on oil-sprayed foliage or *vice versa* is dangerous. Fruits that carry a waxy bloom lose this when sprayed with oil emulsions and the fruit is rendered unsightly. Many observations and carefully conducted experiments on *Citrus* have indicated that the most frequent causes of injury have

been reduced to those associated with unfavourable conditions of application. It appears that spraying can be most safely done after the young fruit has become well set and has reached about the size of a pigeon's egg, and before the coming of the autumn and winter rest period, usually about mid-October or early November. Spraying after this period may materially reduce the subsequent season's set of blossoms. Spraying of *Citrus* immediately before harvest tends to inhibit or greatly delay natural colouring.

Cucurbits should be sprayed with caution as they are usually close to the soil and receive much reflected heat; moreover the foliage absorbs large quantities of oil and the leaves do not stand up.

The effect of arsenicals and certain arsenical substitutes on market garden crops is discussed by F. H. Wymore. Paris green is now little used except in poison baits, and lead arsenate is no longer generally recommended owing to its toxicity to beans and cucurbits. Calcium arsenate had largely replaced lead arsenate in most of the market garden sections of the eastern and central States 5 or 6 years ago, but certain mixtures of this material are nevertheless quite toxic to cucurbits and beans. In combination with gypsum, however, it can be applied under any condition of weather or any stage of the plant without injury. In a very serious case of scorching recorded, 60 per cent. defoliation of lima beans and a reduction in yield to two sacks as compared with 14 to the acre from untreated plants were caused by 22 per cent. calcium arsenate and 78 per cent. sulphur. Magnesium arsenate has been used in the eastern States for the control of the Mexican bean beetle [*Epilachna corrupta*, Muls.], the rate most recently recommended being 1 lb. to 50 U.S. gals. water. Zinc arsenite, which is recommended against caterpillars attacking the fruit buds of apple and pear in the early spring, has been found unsafe on beans in South Carolina. Several cases of severe scorching resulting from the use of sodium fluosilicate are recorded. Sulphur has been used with success against mites on beans at 70–100° F., but scorching has been recorded where it was used above the latter temperature.

Basinger (A. J.). **Field Key for the Determination of some of the common Mealybugs infesting Nursery Stock in California.**—*Mon. Bull. Dept. Agric. California*, xx, no. 2, pp. 189–193, 8 figs. Sacramento, Cal., February 1931.

This key to the more common mealybugs infesting nursery stock in California is based on the external characters of the adult females. The species included are *Pseudococcus aurilanatus*, Mask., *P. nipae*, Mask., *P. adonidum*, L. (*longispinus*, Targ.), *P. citri*, Risso, *P. maritimus*, Ehrh., *P. gahani*, Green, *Rhizoecus terrestris*, Newst., and *Phenacoccus gossypii*, Towns. & Ckll. Brief notes on each are added to give further assistance in identification.

Barrett (R. E.). **A new Pest of the Avocado in California.**—*Pan-Pacific Ent.*, vii, no. 4, p. 191. San Francisco, Cal., April 1931.

Adults and larvae of the Curculionid, *Caulophilus latinasus*, Say, which had not previously been recorded in California, were found in the seeds of avocado in Orange County in April 1931. The seeds were completely riddled.

Newell (W.). **Report of the Plant Commissioner for the Biennium ending June 30th, 1930.**—*Mon. Bull. St. Plant Bd. Florida*, xv, no. 9, pp. 49–143. Gainesville, Fla., March 1931.

This report on the activities of the State Plant Board of Florida consists mainly of a complete account of the campaign carried out against *Ceratitis capitata*, Wied. (Mediterranean fruit-fly) in Florida from its inception on 6th April 1929 up to 31st December 1930. The fly has not been observed since two pupae were found in July 1930, and the intra-state as well as the Federal quarantines respecting it were removed towards the end of the year [*cf.* *R.A.E.*, A, xix, 44].

Entomology.—*49th Ann. Rep. Ohio Agric. Expt. Sta. 1929–30*, Bull. 470, pp. 79–95. Wooster, Ohio, January 1931.

Most of the studies recorded were continued on the lines of previous years [*R.A.E.*, A, xviii, 550, etc.]. In northern Ohio there was a marked decrease in infestation by *Pyrausta nubilalis*, Hb. (European corn borer), and the factors responsible for this change are discussed by L. L. Huber and J. R. Savage in some detail, the major influences being abnormally high temperature and low humidity in the year under review. Investigators are agreed that the height of maize at the period of flight of the moths is a dominant factor influencing oviposition [*cf.* xviii, 75, etc.], and J. B. Polivka and Huber have shown by experiment that the number of larvae attaining full development in early p anted maize was four times as great as in that planted late. C. R. Neiswander and Huber have also shown that larvae compete with one another for shelter or food, or both and, other factors being equal, there is an inverse relationship between the number of eggs deposited and the rate of larval survival. Varietal resistance and varietal tolerance of maize to attack by *P. nubilalis* are briefly discussed. Studies of larval migration by Neiswander and Polivka showed that the crawling period of the larvae began soon after they had become full-grown, the maximum migration occurring about mid-September. Many insecticides tend to injure maize plants, and such physiological disturbance has an independent unfavourable influence on larval establishment ; the insecticide therefore functions both directly and indirectly. Experiments by E. G. Kelsheimer to determine the effect of coloured lights on the behaviour of the moths showed that the colours with shorter wave-lengths were preferred.

Continued work by H. L. Gui with arsenicals at the rate of 4 lb. to 100 U.S. gals. Bordeaux mixture against *Epitrix cucumeris*, Harr. (potato flea-beetle) indicates that their effect is of brief duration. Calcium arsenate gave better control and resulted in a higher yield than lead arsenate. Against white grubs (*Lachnosterna*) in flower gardens, G. A. Filinger found that a solution of 8–10 oz. sodium cyanide in 50 U.S. gals. water sprinkled over the infested area at the rate of 2½ U.S. gals. to each square yard, and washed off the plants one or two hours afterwards to avoid injuring them, gave good results. In lawns, lead arsenate should be used before sowing, 5 lb. mixed with 1 cu. ft. of dry soil or sand being spread evenly over 1,000 sq. ft. of soil surface and incorporated in the top 3 inches of soil by raking or hoeing. Some benefit is also obtained by broadcasting this mixture over the surface of infested lawns and washing it in with water. J. P. Sleesman records three generations of *Hylemyia antiqua*, Mg. (onion maggot) during the

year, damage being chiefly due to larvae of the first generation. Experiments indicate that early planted and thickly sown onions receive a heavier egg deposition and that they are probably more attractive to the adults. A 2 per cent. lubricating oil emulsion gives the most efficient control and does not injure the foliage except under conditions of high humidity. A high soil-water content proved essential to a high rate of larval establishment.

C. R. Cutright points out that the practice of thinning apples on the trees by removing all fruits injured by *Conotrachelus nenuphar*, Hbst. (plum curculio) and leaving them on the ground is favourable to the development of this weevil, whereas if such fruits remain on the tree the eggs or larvae are crushed by the growing tissues of the apple and are killed. Experiments confirming the efficiency of ½ per cent. penetrol as an activator for nicotine against *Aphis pomi*, DeG. (green apple aphis) are briefly discussed [*cf.* xix, 203]. The abnormal season of 1930 produced unusually severe outbreaks of *Cydia* (*Carpocapsa*) *pomonella*, L. (codling moth) even in sprayed orchards. Summer oil sprays (2 per cent.) and lead arsenate dusts (15 per cent.) were tried as a substitute for the late July spray of 1 lb. lead arsenate in 50 U.S. gals. lime-sulphur with the object of lessening the deposit of arsenic on the apples. More injury by *C. pomonella* was caused, however, when they were applied on 30th July and 9th August than when the standard spray was applied on 30th July only. The blotch type of spray is evidently the best unless several applications of a spray carrying a spreader can be used.

Observations by R. B. Neiswander and M. A. Vogel on *Cydia* (*Laspeyresia*) *molesta*, Busck [*cf.* xix, 203] revealed that the mortality of larvae in special cages during the severe winter of 1929–30 was 80 per cent., and this appeared to be a fairly reliable index of field conditions. Of the parasites recorded in the State, *Macrocentrus delicatus*, Cress., was particularly abundant in the south and centre. Experiments indicated that summer oils applied late in the season are more effective than heavy lime sprays early in the season. The best results were obtained by a combination of the two treatments, and seven applications, from 20th May, of a dust of 95 lb. hydrated lime (300 mesh) impregnated with 5 lb. summer oil also considerably reduced the injury caused. An account is given by J. S. Houser of the introduction from New Jersey of the parasite, *M. ancylivora*, Rohw. [*cf.* xix, 361] and of its liberation in orchards infested with *C. molesta*. After the development of a second generation of this parasite, collections of *C. molesta* in orchards showed an average degree of parasitism of 49·7 per cent. by all species, and of this number 75·5 per cent. were parasitised by *M. ancylivora*.

SCHOPP (R.). **The Smartweed Borer** (*Pyrausta ainsliei*, **Heinrich, Lepidoptera**) **in Kansas.**—*J. Kansas Ent. Soc.*, iv, no. 2, pp. 25–38, 8 refs. McPherson, Kans., April 1931.

An account is given of the biology and habits of *Pyrausta ainsliei*, Heinr. (smartweed borer) from a study begun in the autumn of 1929. It is thought that the parasites now attacking this species may in time utilise *P. nubilalis*, Hb. (European corn borer) as a host. The parasites actually reared in Kansas from *P. ainsliei* were *Pyraustomyia penitalis*, Grote, *Microbracon caulicola*, Gahan, an undescribed species of *Macrocentrus*, and the egg parasite, *Trichogramma minutum*, Riley.

Others that emerged from caged smartweed (*Polygonum*) but were not proved to be parasites of *P. ainsliei* were *Microdus* (*Bassus*) *agilis*, Cress., *Calliephialtes notandus*, Cress., *Chelonus* sp., *Bassus* (*Diplazon*) *laetatorius*, F., *Eupelmus rosae*, Ashm., *Microgaster zonaria*, Say, and *Apanteles* sp. Brief notes are given on some of these parasites.

PETTIT (R. H.). **Carrot Rust-fly found in Michigan.**—*Quart. Bull. Michigan Agric. Expt. Sta.*, xiii, no. 3, pp. 119–121, 3 figs. East Lansing, Mich., February 1931.

Psila rosae, F. (carrot rust fly), an important pest of carrots and celery, was first recorded in Michigan in 1914 and not again until 1929, when several acres of carrots were severely injured. Notes are given on its bionomics [*cf. R.A.E.*, A, xvii, 725], and the danger of its spread to the parts of the State where celery is extensively grown is pointed out. In New York, infestation of carrots is avoided by planting the crop about 1st June and harvesting in early September [xvii, 453 ; xix, 352]. Over small areas, several applications at weekly intervals of 2 per cent. Bordeaux oil emulsion to the soil round the roots of the plants is said to afford some protection. Deep autumn ploughing is recommended, and wild carrots and all stored roots found to be infested should be destroyed.

HERRICK (G. W.). **Some Shade-tree Pests and their Control.**—*Bull. Cornell Univ. Agric. Expt. Sta.*, no. 515, 26 pp., 18 figs., 28 refs. Ithaca, N.Y., January 1931.

The following is largely taken from the author's summary : An account is given of the bionomics and control of four common pests of shade and ornamental trees in New York State. A nicotine and oil spray already noticed [*R.A.E.*, A, xiv, 477], applied during the first week in July, will control *Chionaspis pinifoliae*, Fitch, on pines and spruces. *Aphelinus diaspidis*, How., and *Marietta mexicana*, How., were bred from the female scales. Volck light oil (1 : 32) applied during April before the buds burst is effective against *Neolecanium cornuparvum*, Thro, on magnolia, and infested bushes may be freed from the scales by brushing them off in July, when they are large and conspicuous. Experiments have shown that *Phyllocoptes quadripedes*, Shim. (maple bladder-gall mite), which feeds on the foliage of silver maple (*Acer saccharinum*), is destroyed by sprays of lime-sulphur (1 : 8) in the spring before the buds burst ; and *Chermes* (*Adelges*) *abietis*, L. (spruce gall aphis) by lime-sulphur, miscible oils, or nicotine sulphate (1 : 400) with 6 lb. powdered soap to 100 U.S. gals., applied in April.

SMITH (F. F.) & FISHER (H. J.). **The Boxwood Leaf Miner** (*Monarthropalpus buxi* **Labou.**).—*Bull. Pennsylvania Dept. Agric.*, xiii, no. 12 (Gen. Bull. no. 497), 14 pp., 4 figs., 7 refs. Harrisburg, Pa., 1st December 1930.

Brief notes are given on the bionomics and control, by sprays of molasses and nicotine sulphate, of *Monarthopalpus buxi*, Lab. [*cf. R.A.E.*, A, xiv, 65], which causes serious damage to boxwood [*Buxus*] in Pennsylvania. Sprays and dusts are only effective against the adults and must be thoroughly and repeatedly applied. The senior author obtained good control by a daily application, during the emergence

period, of a dust of 40 per cent. nicotine sulphate and kaolin or hydrated lime (1 : 20). The bulk of the paper deals in detail with the hot water treatment of infested nursery plants [*cf.* xvi, 510, etc.] and field experiments in the fumigation of bushes with hydrocyanic acid gas under tents of 12 oz. canvas treated with linseed oil. The tents are supported on wooden frames, 4 x 5 x 5 ft., to enclose 100 cu. ft. of space.

The most uniform results were obtained with 2 oz. sodium cyanide in 6 oz. water and 3 oz. sulphuric acid. Fumigation should be carried out when the plants are in a dormant condition, that is from mid-November to March. The plants should be dry, as any form of moisture will result in foliage injury. A more or less sunny day with a temperature between 40 and 55° F. should be chosen, as the sun raises the temperature in the tents from 10 to 20°, and at a higher outdoor temperature severe injury is likely to occur. In plants fumigated in November, the larvae may appear normal until March, though apparently little feeding occurs and they die in early April. In those treated in the spring, death occurs during May or early June. The auditory method of determining the efficiency of control is described [xviii, 415]. Although fumigation gives a high mortality, it cannot be recommended as a treatment for certification of plants for shipment ; complete eradication could be almost assured if fumigation were followed, during the spring emergence period, by careful spraying. The hot water treatment, properly conducted, will kill all larvae present in infested plants. The plants should be treated in the early spring before growth starts, but late spring treatment, which results in temporary injury, is to be preferred to treatment in the autumn [*cf.* xix, 349].

Psylla (*Psyllia*) *buxi*, L. (boxwood Psyllid) is controlled by both treatments.

PARKER (H. L.). *Macrocentrus gifuensis* **Ashmead, a polyembryonic Braconid Parasite in the European Corn Borer.**—*Tech. Bull. U.S. Dept. Agric.*, no. 230, 62 pp., 21 figs., 32 refs. Washington, D.C., March 1931.

Macrocentrus gifuensis, Ashm., is a primary parasite in the larva of *Pyrausta nubilalis*, Hb. (European corn borer) in common mugwort (*Artemisia vulgaris*) in northern and central France. It also occurs in the northern zone of the corn-borer in Russia and has been reared from it in both maize and hemp in Japan, although it is not present in any of the principal maize regions of Europe.

All stages of the parasite, including the internal and external anatomy of the larval instars, are described. It was at first believed to be *M. abdominalis*, F., which Gahan now considers a distinct species. The species bred by Hergula [*R.A.E.*, A, xviii, 149] from larvae from maize in Jugoslavia is also probably *M. gifuensis*. This Braconid has not been known from hosts other than *P. nubilalis*, but has so often been misidentified that it is possible that many published data on *M. abdominalis* actually refer to it.

Studies of its method of reproduction, which is by polyembryony, a form of development not hitherto recorded for Braconids, are described in great detail, and particulars of the technique employed are given. A brief history of polyembryony in the Hymenoptera is given, present knowledge on this subject being summarised in tables.

The eggs are laid in the body cavity of the young host larvae during the latter part of June and in early July under conditions prevailing in north-western France, the most favourable temperature being 22–25° C. [71·6–77° F.]. The larvae hatch in April by gnawing their way out and in so doing destroy other larvae and germs of their own species. The first instar larvae feed mostly on fat globules, and where the parasites die early in the first stage, their presence does not prevent the host from pupating. The second and third instar larvae feed internally, and by the time the third instar is completed, the host larva can no longer crawl. The fourth instar issues from the host larva and feeds externally, nothing being finally left of the host but the exoskeleton. Each larva spins its own cocoon, and the whole group is bound together in a more or less compact mass, from which, however, individual cocoons can be removed without disturbing the rest. Pupation takes place about the middle of June, and adult emergence toward the latter part of the month. The female lays generally one, but sometimes two or three eggs at a thrust, and as several thrusts are frequently made in the same host, most parasitised host larvae contain several eggs. The consequent excess of larvae and germs present is destroyed during feeding and growth.

In these studies, the average size of a colony emerging from a single host was 24 if all males, 16 if all females and 20·9 if the sexes were mixed; 37·5 per cent. of the colonies were mixed broods. The maximum number of individuals developing from a single egg of *M. gifuensis* is believed to be 8 or 10. The mortality in the laboratory rearings of field-collected host material was 23·6 per cent., exclusive of those killed by their own species. The average length of life of females was 17·6 days and the maximum 36 days, when they were supplied with sweetened or honey water for food. Contact moisture for the host in the spring is necessary for the development of the parasite, otherwise it will die or produce small, unhealthy colonies. The time required to complete development from early spring to the adult stage is 34 days at 25° C. [77° F.], 54 at 20° C. [68° F.], and 60 at 18° C. [64·4° F.]. These temperatures should be accompanied by alternate soakings and dryings of the host material. Parasites in overwintering host larvae may be retarded by cold storage for four months or more after their normal emergence time, but late larval and pupal stages of *M. gifuensis* cannot tolerate exposure to low temperature even for so short a period as 16 days.

A comparison of the physical and climatic characteristics of the zones in France, Russia and Japan where *M. gifuensis* occurs indicates that it apparently flourishes under a variety of conditions, ranging from approximately the continental type of climate with warm summers and extremely cold winters to the climate with warm winters and hot summers accompanied by excessive rainfall, as represented by Nagasaki. None of the zones in which it occurs has a hot, dry summer. The climate in some of the zones in which it does not occur is nevertheless between the extremes within which it is known to flourish.

P. nubilalis has one generation in the French zones, where the larvae start pupating in early May and continue through June. Eggs are laid throughout the latter half of June and July, and the resulting larvae have entered the diapause by the end of August. Nothing is known of the development of *P. nubilalis* in the Russian zone, but in Japan there appear to be three generations a year in the region where *M. gifuensis* is most abundant; the first and early part of the second

coincide more or less with the seasonal history in areas where there are two generations, the second pupating about the end of August and giving rise to a third that overwinters in the larval stage. The seasonal history of *M. gifuensis* synchronises well with the host in the north-western zone of France where it has been intensively studied. Parasitised larvae of *P. nubilalis* received from Russia on 28th November 1928 showed on dissection the presence of later germs, early embryos and first-stage larvae of *M. gifuensis*, a condition corresponding to the development on about 1st April in the north-western zone of France. It is probable that the development of the parasite proceeds more rapidly in Russia in spring and summer, on account of the long cold winters and more abrupt change, than in regions having a more equable climate. In Japan, adults have been reared from July to November, the majority emerging in July and early in August. The high temperatures and humidity prevailing in Japan during the summer probably account for two or more generations a year.

Werner (W. H. R.). **Observations on the Life-history and Control of the Fern Scale,** *Hemichionaspis aspidistrae* **Sign.**—*Pap. Mich. Acad. Sci.*, xiii, pp. 517–541, 3 pls., 5 refs. Ann Arbor, Mich., 1931.

An account is given of investigations on the fern scale, *Pinnaspis* (*Hemichionaspis*) *aspidistrae*, Sign., carried out in Ontario in 1928. This Coccid has a great variety of food-plants, but is essentially a tropical insect and in colder climates only occurs in greenhouses, in which aspidistra and Boston fern (*Nephrolepis exalta* var. *bostoniensis*) appear to be the plants most severely damaged. The stages and the technique used are described. The incubation period occupies 12–18 days. In the case of the female, the two nymphal instars last 24–36 days and the life of the adult scale 9–10 weeks. In the case of the male, there is a third instar the length of which is unknown. The average number of eggs laid by one female is 57. Parthenogenesis does not seem to occur. The Aphelinid, *Aspidiotiphagus citrinus*, Craw, was observed attacking the scales, and by about the first week in March parasitism became so high that it was impossible to complete the intended spraying experiments. In one case a spray of nicotine, soap and water applied to an artificially infested plant apparently delayed moulting.

The maintenance of a high humidity appears to prolong the life-cycle of this Coccid and therefore decrease its rate of reproduction. Ferns should be kept in optimum growing conditions, as these will increase the output of new fronds so that the older ones, which are the most heavily infested, can be removed. All infested plants should be isolated as the Coccids spread rapidly, probably by crawling or by being jarred off the plant during the active period.

Spencer (G. J.). **Insects emerging from prepared Timber in Buildings.** —*Proc. Ent. Soc. Br. Columbia*, no. 27, pp. 6–10, 6 refs. Vancouver, B.C., 1930.

Several instances are recorded from British Columbia of the emergence during recent years of *Buprestis aurulenta*, L., from timber in houses that had been built for a considerable time (up to 20 years), and one of the Cerambycid, *Phymatodes kalmi* var. *dimidiatus*, Kby.,

from rafters at least 6 years old. Under natural conditions, the life-cycle of Buprestids usually occupies 1 year and that of Cerambycids 1–3. Difficulties in accepting the view that the beetles in question had escaped being killed in the preparing of the wood, and after a prolonged larval or pupal period had completed their development in the dry timber are pointed out. On the other hand, Buprestids (*B. fasciata*, F., and, probably, *B. aurulenta*) were observed on two occasions apparently ovipositing in cracks in more or less seasoned wood, and it is suggested that the larvae are capable of developing in prepared timber without first feeding on bark and sap-wood, as they normally do.

ROSTRUP (S.) & THOMSEN (M.). **Die tierischen Schädlinge des Ackerbaues.** [The Animal Pests of Field Crops.]—Med. 8vo, xi+367 pp., 236 figs. Berlin, Paul Parey, 1931. Price *M*.18.

The first edition of this book was issued by the senior author in 1900, and the present volume is a translation of the fourth, revised, Danish edition of 1928. Its translation into German has been undertaken because the insect pests of Germany, especially North Germany, are largely the same as those of Denmark. Some sections on pests peculiar to Denmark have been omitted, and chapters by the translators, Drs. H. Bremer and R. Langenbuch, on *Pyrausta nubilalis*, Hb., *Piesma quadrata*, Fieb., and other insects that are important in Germany have been added. The chief pests are dealt with at length, special attention being paid to descriptions of the characteristic injury caused by each, and to its bionomics and control.

AUFHAMMER (G.). **Fritfliegenbefall an Gerstensorten.** [Frit-fly Infestation of Varieties of Barley.]—*Prakt. Bl. Pflanzenb.*, ix, no. 1, pp. 1–9, 10 refs. Freising, April 1931.

Oats are usually more severely injured by *Oscinella* (*Oscinis*) *frit*, L., than barley, but infestation of the latter has become increasingly frequent in Germany of recent years. Observations on 83 varieties of barley sown on 10th July 1929 in Bavaria indicate that those that mature quickly and produce many leaves when young are least attacked. Of varieties that mature more slowly, those that produce many leaves when young are less attacked than those that do not.

WAHL (B.). **Bericht über die Tätigkeit der Bundesanstalt für Pflanzenschutz in Wien im Jahre 1926.** [Report on the Work of the Federal Institute for Plant Protection in Vienna in 1926.]—Demy 8vo, 79 pp. Vienna, Bundesanst. PflSchutz., 1931.

The insect pests recorded, in addition to some of those already noticed [*R.A.E.*, A, xvi, 7], include *Macrosiphum pisi*, Kalt., which caused serious injury to lucerne in Lower Austria in spring ; *Psylla mali*, Schmidb., which was particularly abundant on apple in the Tyrol ; *Anthonomus rubi*, Hbst., which did much harm to strawberries in the Burgenland districts ; and *Otiorrhynchus crataegi*, Germ., the larvae of which attacked the roots of cyclamen. A number of tests of proprietary insecticides are reported on, and a list of the Institute's publications from 1902 to 1926 and an index to its annual reports for the same period, both compiled by Dr. L. Fulmek, are given.

STRAWIŃSKI (K.). **Doświadczenia z insektycydami sproszkowanemi.** [Experiments with Dust Insecticides.]—*Rocz. Nauk roln. lesn.*, xxv, reprint 36 pp., 24 figs., 12 refs. Posen, 1931. (With a Summary in German.)

An account is given of laboratory and field experiments carried out in 1928 in central Poland with various dusts for the control of *Diprion* (*Lophyrus*) *pini*, L., and *Bupalus piniarus*, L., on pines. The results are given in tables and graphs, and the toxicity of the different insecticides, most of which were proprietary forms of arsenic or copper, is compared. Other tests on the control of various insect pests in Poland by means of dusts are briefly reviewed from the literature, and the economic importance of this method is pointed out.

[GRADOJEVIĆ (M.).] **Градојевић (M.). Méthodes d'examen biologique des larvicides à employer contre la cochenille** *Eulecanium corni* **Bouché et autres représentants de la famille de Coccides.** [*In Serbian.*]—*Bull. Min. Agric.*, ix, no. 32, reprint 46 pp., 12 figs., 11 refs. Belgrade, 1930. (With a Summary in French.)

This paper is a detailed discussion of two methods for determining the toxicity of insecticides against *Lecanium* (*Eulecanium*) *corni*, Bch., experiments with which were carried out in Serbia in the summer of 1928 and spring of 1929. The method to which most attention is directed is based on the fact that the larvae eject honey-dew while infesting the branches or leaves of plum trees in the spring and summer respectively. For laboratory tests, a freshly cut infested branch is placed in a tumbler of water on a glass plate on which the honey-dew will drop and accumulate. After 12 hours the branch is treated with the insecticide tested, by immersion for a few seconds or by spraying, and then placed in a tumbler of water on a different glass plate for a further 12 hours. Comparison of the amounts of honey-dew on the two plates shows the effectiveness of the insecticide ; if all the larvae are killed, no honey-dew occurs on the second plate.

A detailed account is given of the work carried out on these lines in the laboratory and in orchards, in which glass plates were also used. It is possible to determine in 24 hours the minimum lethal concentration of sprays or fumigants, as well as their relative value. The fact that the same infested branch is used for the control and for the test ensures the correctness of the latter, as the number of the larvae is the same. This method could also be used in tests with other Coccids or Aphids that secrete honey-dew.

The other method is based on the spring migration of the overwintered larvae from the trunks to the branches of the infested trees. It consists of applying an adhesive band at the top of the trunk in order to judge the effectiveness of sprays used against the larvae before they start to migrate by the presence or absence of the latter on the band. Another band is applied at the base of the trunk to prevent larvae that have been blown down by the wind from crawling up. Unsprayed trees are similarly banded as controls. This method can only be applied during the very short period of migration of the larvae and on hot sunny days. It is also much less reliable than the honey-dew method, as differences in the numbers of larvae on the treated and untreated trees would greatly decrease the accuracy of the test, and it would be extremely difficult to determine the exact percentage of the larvae killed and the minimum lethal concentration of the insecticide.

Fiori (A.). **Valore sistematico di alcune forme del genere** *Hyponomeuta* **Latr.** [The systematic Status of some Forms of the Genus *Hyponomeuta*.]—*Boll. Lab. Ent. Bologna*, iii, pp. 246–253, 7 refs. Bologna, 1930.

As a result of examination of hundreds of specimens of *Hyponomeuta*, which showed great variation in the colour characters hitherto used to distinguish *H. cognatellus*, Hb., *H. padellus*, L., and *H. malinellus*, Zell., the author is inclined to regard the species occurring on *Euonymus* as *H. cognatellus*, and that on apple, plum and *Crataegus* as *H. padellus*, *H. malinellus* being a synonym of the latter.

Servadei (A.). **Contributo alla conoscenza delle** *Hyponomeuta padellus* **L.,** *cognatellus* **Hbn. e** *vigintipunctatus* **Retz.**—*Boll. Lab. Ent. Bologna*, iii, pp. 254–301, 5 pls., 11 refs. Bologna, 1930.

Descriptions are given of all stages of *Hyponomeuta padellus*, L., the larva and adult of *H. cognatellus*, Hb., and the egg, larva and adult of *H. vigintipunctatus*, Retz. Races of *H. padellus*, of which *H. malinellus*, Zell., is considered a synonym, occur in Emilia on apple, *Crataegus* and plum. The apple race has one generation a year, hibernates as a first-stage larva, mines the leaves in spring, and pupates on the plant [*cf.* *R.A.E.*, A, xix, 288]. Parasites obtained from it were the Ichneumonids, *Herpestomus brunnicornis*, Grav., *Hemiteles areator*, Panz., *Pimpla examinator*, F., *P. alternans*, Grav., *Angitia armillata*, Grav., *Mesochorus vitticollis*, Holmgr., and *Chorinaeus tricarinatus*, Holmgr., the Eulophid, *Tetrastichus evonymellae*, Bch., the Pteromalid, *Habrocytus hyponomeutae*, Masi, the Tachinids, *Discochaeta yponomeutae*, Rond., and *Phorinia aurifrons*, R.-D., and a Dipterous larva of which the adults were not obtained but which is believed to be *Sarcophaga affinis*, Fall. This last species is the most important, destroying up to 60 per cent. of the larvae and pupae. The female oviposits on a caterpillar that has not yet spun its cocoon, and the newly-hatched larva at once penetrates into the host and devours it. It then emerges and cuts its way into the nearest cocoon, two minutes sufficing to empty the pupal case. A larva can thus destroy some 50 pupae. When mature, usually about mid-June, it generally drops to the ground and pupates at a depth of a few centimetres. It is suggested that nests of *H. padellus* containing this parasite should be placed on infested apple trees not later than 10th June ; it is easy to collect as it also attacks the race on *Crataegus*. Other measures recommended are collecting the young larvae of the moth within ten days of the opening of the apple buds, and spraying with 0·7 per cent. lead arsenate in mid-April.

The race of *H. padellus* infesting *Crataegus* does not mine the leaves in spring, but enters the buds. It is parasitised by *H. brunnicornis*, *A. armillata*, *T. evonymellae*, *P. aurifrons* and the Sarcophagid. It does not cause much injury to *Crataegus*, but is dangerous because it can develop on apple, though experimentally the apple race could not mature on *Crataegus*. It was not possible to make a complete study of the biology of the race infesting plum ; it is of negligible importance in Emilia, and is parasitised by *T. evonymellae* and *P. aurifrons*.

H. cognatellus lives on *Euonymus europaea* and *E. japonica*. Like *H. padellus* it has one generation a year, and it hibernates in a similar manner. It infests the buds in spring and pupates under fallen leaves or at a slight depth in the ground. It is parasitised by the Ichneu-

monids, *A. armillata* and *Mesochorus semirufus*, Holmgr., the Encyrtid, *Ageniaspis fuscicollis*, Dalm., and the Tachinid, *Ptychomyia selecta*, Mg.

A. armillata and a Tachinid, *Nemorilla maculosa*, Mg., were obtained from *H. vigintipunctatus*, which has three generations a year and hibernates in the pupal stage. The larvae mine the leaves of *Sedum maximum*, the only food-plant observed, and become gregarious after a period of solitary life. Pupation takes place in the ground.

Curzi (M.). **Una grave acarinosi del pero dovuta a** *Epitrimerus piri* **Nal.** [A severe Infestation of Pear by *E. pyri*.]—*Boll. R. Staz. Pat. veg. Roma*, x, no. 4, pp. 448–452, 1 fig., 1 pl., 10 refs. Florence, 1930.

Of the three Eriophyids known to attack pear, *Eriophyes pyri*, Pgst., *Epitrimerus pyri*, Nal., and *Phyllocoptes schlechtendali*, Nal., only the first-named appears to have been hitherto recorded from Italy, but a serious infestation by *Epitrimerus pyri* was observed in 1930 in the province of Ravenna. A description of the injury to the leaves is given.

Martelli (G.). **Il Pseudococco degli agrumi** (*Pseudococcus citri* **Risso**). [The Citrus Mealybug, *P. citri*.]—*Circ. R. Osserv. Fitopat. Puglie*, no. 10, 8 pp., 7 figs. Taranto, January 1931.

Pseudococcus citri, Risso, is a serious pest of *Citrus* in Apulia. Brief descriptions are given of its various stages together with notes on the injury done. Natural enemies are unable to check it sufficiently, and the measures advised are thinning the crown of the tree and spraying with an emulsion containing 2 per cent. kerosene and 2 per cent. soft soap, or 2 per cent. wood tar oil and ½ per cent. caustic soda. Instructions for preparing these sprays are given.

The Sirividhi of the Vine (*Zygaena ampelophaga*, **Bayle**).—*Cyprus Gaz.*, no. 2128, Agric. Suppl. no. 34, p. 1. Nicosia, 24th April 1931.

In Cyprus, the adults of *Theresia* (*Zygaena*) *ampelophaga*, Bayle, appear at the end of March or the beginning of April and deposit clusters of 100 or more eggs on the shoots and buds of vines. The larvae hatch in 6–8 days, when the buds are about to open, and feed chiefly at sunrise and sunset, on the young leaves and the interior of the buds. After 30–45 days, they pupate in cocoons in the loose bark or amongst dead leaves, the adults emerging in the second half of May. The damage caused by the larvae of the second generation, which appear at the end of May or in June, is of less importance, as the vines have grown considerably. They pupate in cocoons in cracks in the bark, in hollow stems or on the ground, and hibernate as pupae.

Sprays that give satisfactory control and should be applied thoroughly when the larvae first appear and again at least once after an interval of 10 days are 6 oz. lead arsenate in 12 gals. water or Bordeaux mixture and 1 oz. Paris green in 12 gals. water. Lime (9 oz. to 12 gals.) should always be added to the Paris green spray to avoid foliage injury, and it is advisable to add it to the lead arsenate and water. The latter may also be improved by using 5 oz. soft soap, 9 oz. flour or skimmed milk, 20 oz. molasses, or 1¼ oz. gelatine as a spreader and adhesive. Pruning early or late in the season is sometimes practised, the effectiveness of

early pruning depending on whether the buds have been stimulated to grow early before the insects appear, as the damage will then be less severe owing to the leaves only being attacked. When the vines are not pruned until very late, the buds near the end of the shoot grow first and are chiefly infested, and if these are subsequently removed, the ones closer to the base grow and are largely free from attack.

DESHUSSES (L.) & DESHUSSES (J.). **Détermination du pouvoir insecticide du pyrèthre.**—*C.R. Acad. Agric. Fr.*, xvii, no. 13, pp. 517–520, 3 refs. Paris, April 1931.

Reference is made to recent work on analyses of pyrethrum [*R.A.E.*, A, xix, 248], and a summary is given of the results of an analytical enquiry showing in a table the respective contents of pyrethrins I and II in samples of pyrethrum from various parts of France, Spain and Switzerland, these all being superior to the samples of Dalmatian pyrethrum examined. The percentage of pyrethrins is considered a direct measure of the insecticidal value of pyrethrum powders, and it was found that 80 per cent. of the total pyrethrins of the whole flower are contained in the tubular florets. Fully-blown flowers contain from 17 to 47 per cent. more of the total pyrethrins than the half-open ones, and the closed flowers contain even less. The rate of pyrethrins in flowers from a given plantation does not vary to any extent from one year to another, provided that the crop is gathered at the same stage of maturity. The stems contain from 10 to 14 times less of the total pyrethrins than the flowers, and English and American workers have reported that they are from 6 to 10 times less toxic.

[TZEDELER (O. E.).] **Цеделер (О. Э.).** **The Cabbage Moth**—*Plutella maculipennis* **Curt. in Connection with the Cultivation of Mustard.** [*In Russian.*]—*Zh. opuitn. Agron. Yu.- Vostoka*, ix, no. 2, pp. 165–195, 13 figs., 4 graphs, 17 refs. Saratov, 1931. (With a Summary in English.)

Mustard has recently been extensively cultivated in the Lower Volga region, where one of its chief pests is *Plutella maculipennis*, Curt. All stages of this moth are described, and an account is given of its bionomics as observed in the Saratov Government in 1929, many of the details being similar to those recorded in the Petrograd district [*R.A.E.*, A, ix, 345]. In the Lower Volga region there are usually four complete and overlapping generations a year, though occasionally only three may occur. The life-cycle requires from 13 to 33 days, depending on the temperature, and all stages are present simultaneously throughout the summer. Hibernation takes place in the adult or pupal stage, the moths first appearing about the middle of May.

The adults, which are readily attracted by light, may live as long as a month, the oviposition period lasting 4–19 days. On mustard the eggs are laid on the lower and upper surfaces of the leaves along the veins, or, in the case of young plants, on the cotyledons. A female may deposit up to 84 in one day, the total number laid varying from 88 to 314. The chief damage is caused at the end of June and beginning of July, when the mustard is flowering and the larvae of the second and third generations occur together. In 1929 the numbers of the larvae began

to decrease in mid-July, and towards the end of the month they were practically absent from mustard, though single individuals were observed later on wild crucifers. In the insectary, larvae of the fourth generation occurred as late as 25th November. The character of the damage caused by the larvae and the various crucifers on which they were found are discussed. On mustard they pupate in cocoons attached to the leaves, pods or stems of the plants.

In 1929 almost all the pupae of the third generation were attacked by various parasites, which accounts for the scarcity of the adults in August ; over ten species were reared by the author from the larvae or pupae, four being identified as *Angitia fenestralis*, Hlmgr., *Apanteles ruficornis*, Nees, *Diadromus subtilicornis*, Grav., and *Mesochorus* sp. A list of the known parasites of *P. maculipennis* is given. Other natural enemies include birds and Coccinellids, and ants, which carry away the pupae. Remedial measures suggested in the literature are briefly discussed.

[Ioffe (G.).] **Иоффе (Г.). The Wireworm as a Pest of Vineyards.** [*In Russian.*]—*Vestn. Vinogr. Vinodel. Vinotorg. S.S.S.R.*, iii, no. 3, pp. 197–200. Odessa, March 1931.

Considerable damage to young vine seedlings in southern Ukraine is being caused by wireworms, as many as 12 and more larvae of different instars being found in the soil near each vine at depths varying from 0·4 to 3 ins. The character of the damage caused is described.

[Yakhontov (V. V.).] **Яхонтов (В. В.). On the Biology, Ecology and economic Importance of Cotton Aphids.** [*In Russian.*]—*Khlopkovoe Delo*, ix, no. 10–11, pp. 1205–1211, 1 graph. Tashkent, 1930.

An account is given of preliminary investigations conducted during 1929 in eastern Uzbekistan on Aphids attacking cotton, the species concerned being *Aphis gossypii*, Glov., *A. laburni*, Kalt., and *Xerophilaphis plotnikovi*, Nevs., and to a less extent *A. flava*, Nevs., and *Macrosiphum* (*Acyrthosiphon*) *gossypii*, Mordv. Colonies of Aphids first appear on cotton as soon as it begins to grow. They are most abundant in late June or early July, after which they practically disappear until mid-August, when they again begin to increase in numbers. *A. gossypii* and *A. flava* are the predominant species in August and *A. laburni* and *X. plotnikovi* in the earlier part of the season. Investigations showed that the plants outgrow the injury caused by the last two unless the colonies are large and more than 30 per cent. of the leaves are infested. In cases of heavy infestation, however, a loss of up to 40 per cent. of the entire crop of cotton may result. The susceptibility of different varieties of cotton to infestation by Aphids is discussed.

Observations indicated that *A. gossypii* does not readily attack plants that have been previously infested by other Aphids, especially *A. laburni*, and that it increases less rapidly on such plants. Under laboratory conditions it matured in 5–10 days, and the adults lived 10·2 days on an average, with a maximum of 46. They may continue to produce young for 14–20 days, provided that the temperature is not

below 10° C. [50° F.] or above 30° C. [86° F.]. *A. flava* matured in 7–8 days, and the adults lived for 12–36. The larval and adult stages of *X. plotnikovi* lasted 5–11 and 7–35 days respectively. *M. gossypii* is the least injurious species, as it forms only small colonies of 6–7 larvae, and attacks advanced leaves of coarse varieties of cotton. Infestation by *A. laburni* was always more severe when cotton was growing in the vicinity of false acacia trees [*Robinia*], on which it is numerous in early summer.

The chief natural enemies of these Aphids are Coccinellids, including *Adonia variegata*, Goeze, *Adalia bipunctata*, L., ? *Scymnus frontalis*, F., and ? *Exochomus melanocephalus*, Zubk.

[ENGEL'HARDT (V.) & MISHCHENKO (A.).] **Энгельгардт (В.) и Мищенко (А.). Pests of Soy Beans in the Far East.**—*Diseases and Pests of Soy Beans in the Far East* [*In Russian*], reprint pp. 85–112, 14 figs., 1 fldg. table, 10 refs. Vladivostock, Izd. dal'nevost. kraev. zem. Upravl. [Pub. Regional Land Administr. Far East], 1931.

Brief notes are given on the bionomics of over 40 insect pests of soy beans observed in the Russian Far East in 1928 and 1929 and in some cases on their control, with a key based on the character of the injury caused. Among the most important is *Cydia* (*Eucosma*) *glycinivorella*, Mats., which caused a loss of 20–30 per cent. of the seeds. The eggs are laid on the pods in late July and August, and the larvae hollow out the seeds. At the end of September they abandon the pods and spin cocoons in cracks in the soil, hibernation taking place either in the larval or pupal stage. Ploughing late in the autumn or early in the spring is recommended to destroy the cocoons. An unidentified Bruchid damaged over 15 per cent. of the seeds, but very little is known of its biology. The larvae of *Phorbia* (*Hylemyia*) *cilicrura*, Rond., destroyed 10–15 per cent. of the seedlings by feeding on the cotyledons in June and mining in the stems of the young plants. The adults emerge in mid-July. The injury caused is more serious if the seed is sown late or inserted deeply. The overwintered adults of *Monolepta nigrobilineata*, Motsch., which hibernate in the soy bean stubble or in cracks in the soil, attack the young shoots in May. The eggs are deposited in mid-June in the soil at the base of plants, where the larvae develop without causing any apparent injury. The adults emerge at the end of July or beginning of August and feed on the epidermis of young stems, but only do slight damage ; those of the second generation eat out round holes in the pods and feed on the seed.

Pests of somewhat less importance include *Gryllotalpa africana*, P. de B., which occurs in heavy and moist soils and destroys 8–20 per cent. of the plants ; the larvae of *Lachnosterna* (*Holotrichia*) *diomphalia*, Bates, which are found in loose, dry soil, especially near forests; *Epicauta dubia*, F., and *E. megalocephala*, Gbl., the adults of which are especially harmful to young crops ; *Pagria signata*, Motsch., the adults of which migrate from weeds and cause serious damage to the young plants in July, by eating out holes in the leaves ; *Agrotis* (*Rhyacia*) *ypsilon*, Hufn., which is especially injurious at the end of June to the sprouting plants ; and *Cirphis unipuncta*, Haw. [*R.A.E.*, A, xvi, 41], which causes severe damage at the end of June and in the first half of July and may pass its whole larval period on soy beans.

C[ORBETT] (G. H.). **Entomological Notes. First Quarter 1931.**—*Malayan Agric. J.*, xix, no. 4, pp. 194–196. Kuala Lumpur, April 1931.

Records are given of the occurrence in Malaya of various well-known pests during the first quarter of 1931. In connection with coconut pests, it had been previously observed that the Tachinid, *Chaetexorista javana*, Br. & Berg., was not apparently so important an enemy of *Parasa lepida*, Cram., as of *Setora nitens*, Wlk., *Apanteles parasae*, Rohw., being a more evident parasite of the larvae of *P. lepida*. It now appears that the predominance of *A. parasae* over *C. javana* is due to the development of the former at the expense of the latter. Three larvae of *P. lepida* collected in March from nipah palm [*Nipa fruticans*] contained several larvae of the Tachinid. About 50 larvae of *A. parasae* were also found in one of the host larvae on dissection, and *A. parasae* emerged from the other two.

Lasioderma serricorne, F., is recorded as causing injury to the bindings and leaves of books. Books in cases fitted with wire gauze are less liable to attack than those in closed bookcases. A mixture of 1 oz. mercury bichloride, 1 oz. carbolic acid and 1 qt. methylated spirit is recommended for preserving books [*cf. R.A.E.*, A, xviii, 617].

LOPEZ (A. W.). **The White Leaf Louse of Cane and the Introduction of a New Wasp Parasite of it.** [*In English and Spanish.*]—*Sugar News*, xi, no. 9, pp. 519–528, 6 figs., 2 pls., 1 ref. Manila, P.I., September 1930. [Recd. 1931.]

Oregma lanigera, Zhnt., is of considerable economic importance in the Philippines, being found along the entire western coast of Negros and on Luzon. Sugar-cane of all common varieties is stunted by the feeding of the Aphid and the sooty mould associated with it. Reproduction is viviparous and parthenogenetic. Control measures suggested are removing and burning the infested leaves and releasing the natural enemies in April or May, when the Aphids first appear, or using a contact insecticide, such as creoline, before the attack has become serious. Heavy rain combined with moderately heavy wind considerably reduces the numbers of the Aphid. It is attacked by several natural enemies, including the larvae of a small moth, *Thialella* sp., the Neuropteron, *Osmylus* sp., and *Syrphus* (*Dideopsis*) *aegrotus*, F., the Coccinellid, *Synonycha grandis*, Thnb., and a Hymenopterous parasite, probably a Proctotrupoid. In July 1930 a consignment of the Chalcid, *Encarsia flavoscutellum*, Zhnt., notes on the life-history of which are quoted [*R.A.E.*, A, xiv, 591], was imported from Java, parasitised Aphids being shipped on growing stools of cane and also on leaves in glass tubes kept in cold storage. On 7th August, 21 adults were observed, and numbers subsequently appeared daily in the insectary.

JARVIS (E.). **Control of our large Moth Borer of Cane** (*Phragmatiphila truncata* **Walk.**).—*Queensland Agric. J.*, xxxv, pt. 3, pp. 141–144, 1 pl. Brisbane, 1st March 1931.

A brief account is given of the bionomics of *Phragmatiphila truncata*, Wlk., a pest of sugar-cane in Queensland [*cf. R.A.E.*, A, iv, 344; xiv, 96, etc.], with short descriptions of the adult, pupa and larva. The

fact that the larva remains only a few days in one shoot [xvii, 241] is probably due to the decay of the succulent central core. From field observations, it appears that a single egg is attached to the base of the cane shoot in a secluded position close to the ground. Four generations of the moth probably occur annually ; the one appearing in the spring (September-November), when most of the cane is small, usually causes most damage to young plant and ratoon crops.

The larvae are attacked by the Braconid, *Apanteles flavipes*, Cam. (*nonagriae*, Oliff), and as this parasite may lay nearly 100 eggs and has a life-cycle of only three weeks, the damage caused by *P. truncata* in the Cairns district seldom assumes serious proportions. After 14 days the larvae of the parasite leave the host caterpillar and spin silken cocoons, attached together in a mass, either near the empty skin of the host in a tunnel in the cane or behind loosened leaf sheaths, etc. A description is also given of the female of a Tachinid that attacks the larvae [iv, 344].

THOMAS (J. E.). **Ethylene Oxide as a new Fumigant for Dried Fruits.**—*J. Council Sci. Indust. Res.*, iv, no. 1, pp. 53–54. Melbourne, February 1931.

An account is given of recent discoveries with regard to ethylene oxide as a fumigant for dried fruits [*R.A.E.*, A, xvii, 87 ; xviii, 60, 407]. Further experiments with *Plodia interpunctella*, Hb. (dried fruit moth) in the laboratory show that this fumigant is effective against the eggs, larvae and pupae. At mean temperatures of about 68° F., a dosage rate of 2 lb. per 1,000 cu. ft. with 4 hours' exposure was sufficient to destroy eggs and larvae in dried fruit.

T[ILLYARD] (R. J.). **The Control of the Eucalyptus Weevil** (*Gonipterus*) **by Parasites in South Africa and New Zealand.**—*J. Council Sci. Indust. Res.*, iv, no. 1, pp. 57–58. Melbourne, February 1931.

The Mymarid egg-parasite of the eucalyptus weevil, *Gonipterus* [*scutellatus*, Gyll.], which was determined by Girault as *Anaphoidea nitens*, Gir., and later named independently *A. gonipteri* by Ferrière [*R.A.E.*, A, xviii, 426], and which has recently been introduced into South Africa from Australia [*cf.* xvii, 606, etc.], is now averaging 90 per cent. parasitism of the weevil, with a maximum of 96 per cent. in the rainier areas of Cape Colony and Natal. In the drier areas of the Transvaal, however, it has not proved successful, and a Cleonymid (apparently *Secodella viridis*, Gir.) has been introduced from the district around Canberra, where the climate is similar, and two colonies have been released. The Mymarid only has been sent to New Zealand, where it is becoming well established ; it has already been recovered in North Island and in Auckland from liberations made in 1927–28.

HYDE (W. C.). **Phthorimaea Moth attacking Tomato Plants.**—*N. Z. J. Agric.*, xlii, no. 3, pp. 175, 211. Wellington [N.Z.], 20th March 1931.

The larvae of *Phthorimaea melanoplintha*, Meyr., which has many generations in one season, has recently caused severe damage to tomatos in most of the middle districts of New Zealand. The moths lay their

eggs about the bases of the plants, and the larvae tunnel in the stems just above the ground. Pending the results of experiments on control, lead arsenate should be added to the usual Bordeaux spray and thoroughly applied to the bases of the stems, and all refuse from tomato and any other solanaceous plants should be destroyed.

FRAPPA (C.). **Contribution à l'étude des Curculionides nuisibles aux plantes cultivées à Madagascar.**—*Bull. écon. Madagascar*, xxvii, no. 1, Docum. études, pp. 241–259, 47 refs. Antananarivo, 1930.

Notes are given on 29 Curculionids injuring cultivated crops in Madagascar, with recommendations for control of the more important ones. Apart from cosmopolitan species, such as *Cylas formicarius*, F., and *Cosmopolites sordidus*, Germ., they include *Stiamus brachyurus*, Pascoe, the adults of which feed on the leaves of sugar-cane ; *Cratopus punctum*, F., the larvae of which feed on the roots of sugar-cane, and the adults, which are polyphagous, on the flowers of vanilla, the leaves of coffee, etc. ; *Polycleis bohemani*, Boh., on vines, peaches and loquat [*Eriobotrya japonica*] ; *Lixus defloratus*, Ol., and *Alcides excavatus*, Ol., both on vine and mulberry ; *A. convexus*, Ol., the larvae of which attack the tubers of sweet potato and the adults the leaves ; *A. olivaceus*, Gerst., on cacao ; *A. curtirostris*, Fairm., and *Baris perrieri*, Fairm., on cotton ; *Epiphylax quadricollis*, Fairm., *E. semifrenatus*, Fairm., and *Gaudarius variegatus*, Fairm., on various wild rubber-producing plants ; *Perissoderes oblongus*, Hust., and *P. ruficollis*, Waterh., on vanilla [*cf. R.A.E.*, A, xvii, 266] ; *Rhina nigra*, Drury, the larvae of which tunnel in the hard wood of coconut palms ; and *Apoderus humeralis*, Ol., which destroys the leaves of beans and other leguminous plants.

BOURIQUET (G.). **Les maladies de l'arachide à Madagascar.**—*Bull. écon. Madagascar*, xxvii, no. 1, Docum. études, pp. 295–300, 16 refs. Antananarivo, 1930.

Among the diseases of ground-nuts (*Arachis hypogaea*) discussed is rosette, which had not been previously recorded from Madagascar, though it has occurred there for some years, It is known to be transmitted elsewhere by *Aphis leguminosae*, Theo., and small unidentified Aphids were found on infected plants. As such Aphids may migrate in the adult stage from infested plants left in the ground from one season to another, it is suggested that all plants left after the crop is taken should be destroyed, together with any of the next season's growth that show any symptoms of the disease. Early sowing is also recommended, as late-sown plants are more heavily attacked and harbour large quantities of Aphids.

SMITH (K. M.). **Composite Nature of certain Potato Viruses of the Mosaic Group.**—*Nature*, cxxvii, no. 3210, p. 702, 3 refs. London, 9th May 1931.

In previous experiments on the transmission of a potato mosaic virus to tobacco [*R.A.E.*, A, xvii, 636], it was found that in tobacco the symptoms produced by needle scratch differed from those induced by the feeding of *Myzus persicae*, Sulz. By the development of a

technique of virus isolation, it has since been shown that the disease induced by needle inoculation is caused by a virus complex, of which the symptoms are gross lesions and severe necrosis of the veins. The Aphid transmits only one of the constituent viruses, and the symptoms are darkening of the green colour of the tissues along the veins. The second virus, of which the symptoms in tobacco are double concentric rings with a central spot, was isolated by inoculating the complex into plants, such as *Datura stramonium* and *Solanum dulcamara*, that remove the Aphid virus, to which they are not susceptible. When tobacco plants inoculated with " ringspot " from a " filter " plant were subjected to feedings by infected Aphids, the symptoms ultimately produced were typical of the complex disease before the viruses had been separated.

The majority of diseases studied by these methods are shown to contain two constituent viruses, but there is evidence of the occurrence of a third, and in some cases only one has been isolated.

McClintock (J. A.). **Cross-inoculation Experiments with Erigeron Yellows and Peach Rosette.**—*Phytopathology*, xxi, no. 4, pp. 373–386, 3 figs., 19 refs. Lancaster, Pa., April 1931.

The recent occurrence of peach rosette in Kentucky and Illinois indicates that the disease has wild hosts in these areas and that natural vectors are spreading it to cultivated plants. In Tennessee, *Erigeron canadensis*, a common weed in waste lands, was found to be infected with a disease causing symptoms strikingly similar to those of peach rosette. As it is known that aster yellows can be transmitted to *E. canadensis*, it was assumed that the virus in question was that of aster yellows. Although this disease appears to be distinct from peach yellows [*cf.* *R.A.E.*, A, xv, 285], the fact that peach rosette has a greater known range of host plants than the latter appeared to indicate the possibility of its transmission to *Erigeron* with symptoms similar to those of aster yellows, whereas it appeared in peach and plum as rosette disease.

Numbers of cross inoculation experiments were therefore carried out and are described in detail. In no case was aster yellows in *Erigeron canadensis* inherited through the seed. Attempts to transmit it from *Erigeron* to peach by means of *Lygus pratensis*, L., or various Aphids, Jassids, Coleoptera and grasshoppers or by mechanical inoculations gave entirely negative results. Transmissions of rosette from plum to peach and sand cherry (*Prunus pumila*) and from sand cherry to peach by infected buds were 100 per cent. effective, but it was not transmitted from sand cherry to *E. canadensis* either mechanically or by means of Aphids, *Pseudococcus citri*, Risso, or *Lygus pratensis*.

Mackie (D. B.). **Heat Treatments of California Fruits from the Standpoint of Compatibility of the Florida Process.**—*Mon. Bull. Dept. Agric. California*, xx, no. 3, pp. 211–218, 1 fig., 1 ref. Sacramento Cal., March 1931.

A brief synopsis is given of investigations conducted in California to obtain an idea of the effect on a number of fruits and vegetables of exposure at a temperature of 110° F. in a saturated atmosphere for a period of 8 hours, an environment known to be lethal to the eggs or larvae of the Mediterranean fruit-fly [*Ceratitis capitata*, Wied.] in fruit [*R.A.E.*, A, xviii, 547].

An apparatus is described by means of which saturated air at 112° F. is circulated around stacked fruit, to which the latent heat of vaporisation is imparted by condensation. The air is re-heated by contact with steam and brought back to the desired temperature by a water jet, the treatment thus being progressive. As the outside layer of the fruit becomes heated to the point at which the vapour no longer condenses upon it, the condensation takes place upon the next layer, until the mass is heated throughout. The effects on fruit are in some cases striking. All mechanical injuries become very evident and show as dark areas. About 85 per cent. of the pathogenic organisms responsible for decay seem to be destroyed. The effects of this treatment on numerous varieties of fruit and vegetables are discussed.

Browne (A. C.). **Cold Storage as a Means of destroying Mealybugs on Fruit.**—*Mon. Bull. Dept. Agric. California*, xx, no. 3, pp. 219–229, 3 figs. Sacramento, Cal., March 1931.

The quarantine maintained in Hawaii against fruits infested with *Heliothrips fasciatus*, Perg., *Pseudococcus maritimus*, Ehrh., and *P. gahani*, Green, all of which are common and widely distributed in parts of California, affects the export of fruit from that country to Honolulu. Special fumigation practices have been developed to cope with the thrips on oranges and persimmons, but pears arriving at Honolulu infested with *P. maritimus* were refused entry. An investigation was therefore instituted to determine whether pears badly infested with this mealybug could be rendered marketable by maintaining them at constant subatmospheric temperatures for given periods. Infested pears picked on 4th October were wrapped in individual paper wrappers, packed in lidded boxes and placed in cold storage on 8th October, a constant temperature of 31° F. and a humidity of 85 per cent. being maintained. The pears were not submitted to any washing or dusting process, so that much larger numbers of mealybugs and egg-masses remained on the fruit than if it had been handled strictly in accordance with marketing practices. One box at a time was removed for inspection at intervals between 24th October and 1st December. The fruit was removed at least 24 hours before inspection, to allow it to become warm enough to assist in reviving the living mealybugs. The percentage of those remaining alive was 60·99 after 17 days, 17·46 after 24, 4·37 after 36, 0·94 after 42, and none after 54.

It is difficult to ascertain how long an adult mealybug can survive at 31° F., but it appears that the younger individuals are more susceptible than adults. The condition of the bodies in the first box examined seemed to indicate that dehydration had taken place. Observations continued throughout the five remaining lots showed the survivors to be larger and more fully developed in each case, and better able to withstand the lack of normal heat and the desiccation going on at a time when the body functions were suspended or reduced to a point inadequate to maintain a normal body moisture content. The speed of the revival of insects from aestivation or hibernation is known to be largely proportional to their ability to re-establish a normal body moisture content. As regards the effect of the treatment on the fruit itself, although the rate of respiration of ripening fruits is greatly reduced at subatmospheric temperatures, the safe humidity limits are proportionately narrowed, so that the danger of wilting must always be considered.

Wolff (K. L.). **Water Courses as a possible Element in the early Spread of the Walnut Husk-fly in Southern California.**—*Mon. Bull. Dept. Agric. California*, xx, no. 3, pp. 230–233, 1 map. Sacramento, Cal., March 1931.

A study of the peculiar distribution of *Rhagoletis suavis completa*, Cress. (walnut husk-fly) in walnut orchards in southern California, which could not be satisfactorily explained by mechanical transport or dissemination by wind, indicated a definite relationship between the courses followed by streams at flood stage and each individual infestation known to exist in Los Angeles county at the close of 1928. A somewhat similar condition exists between water courses and orchards found infested up to 1929 in San Bernardino county, though the consistency of the relationship has not been so closely checked. Channels that carry water in time of floods have been found to be close to, and to some degree to form a connection between, several of the orchards originally found infested in 1926. Although it is difficult to place the exact year or years when flood water may have scattered the pupae, the available records, though incomplete, show repeated heavy flooding and high rainfall in the districts concerned. The rainy season occurs in winter; the pupal period of the fly, which is spent in the soil, is approximately from October to July.

If the pupae were carried along these channels at flood time, they most probably originated from some unknown food-plant in the San Gabriel mountains. An expedition was made in August 1929 in an attempt to find such a food-plant. Although no husk-fly infestation was discovered, several wild fruits were observed to have physical properties that would support the larvae, the most outstanding being California laurel (*Umbellularia californica*). Fresh oak-galls were also of a consistency to support the larvae. No native stands of California black walnut (*Juglans californica*) are known to exist in the watershed of the channels concerned.

An alternative theory of the dissemination of material infested with larvae or pupae from the transcontinental railway, which crosses all these water channels, was investigated to some extent in 1930 with negative results. The spread of the fly in Los Angeles county, between the close of 1928 and January 1931, has consisted, with the exception of a single infested nut, of an expected gradual widening and filling of areas already known to be infested, but in San Bernardino it was found to be well established on some scattered trees 20 miles from the nearest infestation known to have existed in the previous year, and other infestations were found at intermediate points. Here again is a long-range distribution, in which, although the prevailing winds favour the direction of spread, the factor of direct dissemination from some unknown source in the mountains is possible.

Mackie (D. B.). **The Indian Pod Borer.**—*Mon. Bull. Dept. Agric. California*, xx, no. 3, pp. 234–235. Sacramento, Cal., March 1931.

Owing to the severe drought that affected an extensive area in the central and south-western United States in 1931, a change is likely to occur in the status of certain of the leguminous crops used for forage or green manure in favour of more resistant varieties. Among those that showed high ability to withstand the prolonged dry weather and make a seed crop was *Phaseolus mungo*, which in Asia and the Indo-

Malayan region, its country of origin, is the normal food-plant of *Maruca testulalis*, Geyer, a highly destructive Pyralid. The larvae enter the pod at the stem end and feed on the beans, generally not leaving until the last bean is eaten. Pupation normally takes place in the ground, but sometimes occurs in litter or dry pods. This variation in habit was probably responsible for the introduction of the moth into Cuba, where it has transferred its attention to the Lima bean (*Phaseolus lunatus*) and is the most important pest of this crop [*cf. R.A.E.*, A, xviii, 507].

In view of the possible increase in imports of *Phaseolus mungo* into the United States, the danger of the introduction of *M. testulalis* is pointed out.

Keifer (H. H.). **Miscellaneous Insect Notes and Descriptions.**—*Mon. Bull. Dept. Agric. California*, xx, no. 3, pp. 249–250, 1 fig. Sacramento, Cal., March 1931.

Brief notes are given on the distribution in California of *Phenacoccus gossypii*, Towns. & Ckll. (Mexican mealybug), which appears to be spreading northwards; the Byrrhid, *Eulimnichus evanescens*, Csy., which is recorded as infesting blue grass [*Poa*] and clover; and *Phorbia* (*Hylemyia*) *planipalpis*, Stein, which attacks cabbage and turnips. The adult of *E. evanescens* and the larva of *P. planipalpis* are briefly described.

Pettit (R. H.). **Report of the Section of Entomology** [1927–28].—*Ann. Rep. St. Bd. Agric. Michigan 1927–28*, reprint 20 pp., 11 figs. [East Lansing, Mich., 1928.] [Recd. 1931.]

Among the insect pests recorded during the year 1927–28, the following are of particular interest or are recorded for the first time from Michigan: *Holcocera maligemmella*, Mrtf. (fringe-winged apple bud moth), which was noticed for the first time in 1927, but does not appear to be a major pest in Michigan, as the larvae seem to feed only in the mummied apples of the previous year's crop; *Argyroploce* (*Endothenia*) *hebesana*, Wlk., the larvae of which feed in the seed pods of iris and various other garden plants; and *Pityophthorus ramiperda*, Swaine, *P. puberulus*, Lec., and *P. granulatus*, Swaine, which tunnel in the tips of new twigs of white pine [*Pinus strobus*], attacking otherwise healthy and vigorous trees.

Pettit (R. H.). **Report of the Section of Entomology** [1928–29].—*Ann. Rep. St. Bd. Agric. Michigan 1928–29*, reprint 19 pp., 13 figs. [East Lansing, Mich., 1929.] [Recd. 1931.]

Among the insect pests recorded during the year 1928–29, the following are of particular interest or are recorded for the first time from Michigan: *Phyllotreta aerea*, Allard, which has only recently been discovered in America [*cf. R.A.E.*, A, xiv, 472], on cabbage, swedes and radishes; *Heterocampa bilineata*, Pack., which practically defoliated about 800 acres of fully-grown beech trees; *Sphenophorus* (*Calendra*) *zeae*, Walsh, which destroyed 20 acres of maize; and a Chrysomelid, *Calligrapha rhoda* var. *walshiana*, Blatch., injuring purple plums, which had only been recorded from America twice previously.

PETTIT (R. H.). **Report of the Section of Entomology** [1929–30].—*Ann. Rep. St. Bd. Agric. Michigan 1929–30*, reprint 19 pp., 18 figs. East Lansing, Mich. [1930.] [Recd. 1931.]

Among the insect pests recorded during 1929–30, the following are of particular interest or are recorded for the first time from Michigan: *Phenacoccus gossypii*, Towns. & Ckll., in greenhouses, where it was controlled by a spray of 1 U.S. pt. 40 per cent. nicotine sulphate, 2 U.S. qts. penetrol and 100 U.S. gals. water; *Eriophyes* (*Phytoptus*) *thujae*, Garm., infesting red cedar [? *Juniperus virginiana*], turning the leaves a greyish colour and seriously impairing their vigour; *Epargyreus tityrus*, F., which defoliated black locust trees [*Robinia pseudacacia*] over a large area; *Pissodes rotundatus*, Lec., attacking young trees of white spruce [*Picea canadensis*], working under the bark near the surface of the soil; the Dermestid, *Trogoderma versicolor*, Creutz., destroying dried sweet maize kept for seed; and *Tipula mingwe*, Alex., severely damaging fields of mint.

MAUGHAN (W.). **Control of the White Pine Weevil on the Eli Whitney Forest.**—*Bull. Yale Univ. Sch. Forestry*, no. 29, 37 pp., 8 pls., 1 chart, 5 refs. New Haven, Yale Univ., 1930. Price 35 *cents*.

Pissodes strobi, Peck (white pine weevil), which often deforms white pine (*Pinus strobus*) to such an extent that the trees are unfit for commercial use, has become of increasing importance in view of the widespread forest planting in Connecticut during the last 30 years. An account is given of its bionomics [*cf. R.A.E.*, A, xviii, 416, 469, etc.] and the effect of infestation on the trees. Control work, which was begun in 1919, consists of pruning and burning the infested leaders when they are seen to wither and turn brown. One of the lateral branches in the whorl below will then take the lead. Pruning is done once a year for an average period of 8 years, from the time the plantation is first infested, which is rarely before the fourth year, to the time when the side branches of the trees come together, the subsequent damage not being sufficient to necessitate the increased cost of control. The objective is to reduce the infestation so that sufficient trees free from attack, or only slightly injured, in the lower 17 ft. will remain to furnish a fully stocked stand of acceptable stems (200 to the acre).

As a result of investigations in 1930, it was found that the removal of infested tips brings about a marked reduction in the amount of infestation during the succeeding years, which becomes noticeable after the second or third year. The treatment of white pine planted on the better sites is economically justified, but on poorer sites it does not secure enough acceptable stems, and the use of other species, such as red pine (*Pinus resinosa*), is suggested.

The technique by which the infested branches were removed and the methods by which the results of control were determined are described in detail.

BALDUF (W. V.). **The Oviposition Habits of *Feltia subgothica* Haw. (Noctuidae, Lep.)**—*Proc. Ent. Soc. Wash.*, xxxiii, no. 4, pp. 81–88, 8 refs. Washington, D.C., April 1931.

The adults of *Feltia subgothica*, Haw., of which *F. ducens*, Wlk., is found to be a synonym, during recent years have been observed frequenting the flowerets of *Helianthus* spp. in Ohio, and investigation has revealed many eggs and young larvae in the flowers. Apparently it is

the normal habit of this species to oviposit in the flowerets rather than on leaves or stems of plants or on the soil, as is usual with cutworm moths. There are about twenty species of *Feltia* occurring in the United States, but only the above-named and *F. annexa*, Treit. (granulated cutworm) and *F. gladiaria*, Morr. (clay-backed cutworm) occur commonly in any numbers. The general life-history and habits of these species are discussed. It was not possible to trace the larvae of *F. subgothica* after leaving *Helianthus*, but if it is generally true that this moth, and perhaps related species also, limit their choice of plants used for oviposition to *Helianthus* or similar wild Composites, the cutworms could be effectively controlled by keeping the neighbourhood of cultivated fields free from these plants.

Vance (A. M.). *Apanteles thompsoni* **Lyle, a Braconid Parasite of the European Corn Borer.**—*Tech. Bull. U.S. Dept. Agric.*, no. 233, 28 pp., 7 figs., 30 refs. Washington, D.C., April 1931.

The following is taken mainly from the author's summary: *Apanteles thompsoni*, Lyle, all stages of which are fully described, is a gregarious Braconid found most abundantly in Europe in the neighbourhood of Lille, France, where it occurs as an internal parasite of the larva of *Pyrausta nubilalis*, Hb., infesting *Artemisia vulgaris*. It has also been recorded from the same host in both *Artemisia* and maize in the Jura area of eastern France, and in maize in the region of Bayonne, France, and probably in the Danaprisian Zone of Russia. Winter shipments of the host larvae have been made to the United States from 1926 to 1929 from the neighbourhood of Lille, and a total of 159,355 individuals of the parasite has been reared from this material.

The host larvae are usually collected from the field between the middle of October and the end of March, cut out of the dry *Artemisia* stems, packed in specially designed tin containers, and shipped to the United States, where emergence of the parasite is obtained the following spring.

The economic importance of *A. thompsoni* has varied from year to year in its natural habitat, and its prevalence within restricted areas has differed considerably. The maximum parasitism recorded for the species is 42·6 per cent., found in a lot of corn borer larvae from Lille in 1924, with an average of 22·9 per cent. for all collections made that year. Since 1924 parasitism has been much lower, the highest annual average in the 5-year period 1925 to 1929 having been only 6·6 per cent.

A. thompsoni is thelyotokous, the male being entirely unknown. Examples of thelyotoky recorded by various writers among the Chalcids, and more rarely among the Ichneumonids, are quoted. The present record is thought to be the second example of this form of parthenogenesis among Braconid parasites. Laboratory observations, the technique of which is described, showed that the female usually deposits 20–25 eggs within the body of the young larva of *P. nubilalis*. After about 5 days the eggs hatch, and the resulting larvae pass two full instars and the greater part of a third within the host, feeding upon its substance. When nearly full-grown, they issue from the host and spin their cocoons, emergence of the adults occurring about 14 days later. The female is capable of depositing several hundred eggs and may oviposit more than once within the same host larva. A normal colony of *A. thompsoni* consists of 15–20 individuals; a colony of 61 was the largest found in the course of dissection. The host larva from which

the parasites have issued dies, but actual death may not occur for a number of days or even several weeks.

The developing embryo within the egg of *A. thompsoni* is surrounded by an envelope of serosal cells, which often remains partly attached to the hatched larva for several weeks. Observations by other workers of similar embryonic envelopes among certain species of Hymenopterous parasites are quoted. Adults of *A. thompsoni*, if provided with proper moisture and food, may be kept alive in the laboratory for several weeks, and oviposition in young larvae of *P. nubilalis* is easily obtained. The parasite overwinters as a partly-grown first instar larva within the body of the host, resumes development in early spring, and issues from the host to spin its cocoon between mid-April and mid-May. Adult emergence starts by the end of the second week in May and continues until early June. According to the data at present available, there is only one generation a year in the Lille region.

PICKLES (A.). **Parasitic Control and the Froghopper Problem.**—*Min. Proc. Froghopper Invest. Comm. Trinidad & Tobago*, pt. xx, pp. 247–253. Trinidad, 1931.

PICKLES (A.). **Froghopper Ecology.**—*Trop. Agriculture*, viii, no. 5, pp. 127–130, 15 refs. Trinidad, May 1931.

In these papers the author points out that *Tomaspis saccharina*, Dist. (sugar-cane froghopper) was in all probability originally a forest insect and has become established in the cane fields of Trinidad by reason of the power of aestivation possessed by the egg. In the forest the froghopper may be found at all seasons, breeding in the damp grass, and provides constant food for its natural enemies, which keep it within bounds. During the dry season in the cane fields, while the froghopper aestivates, there is no food for its enemies, and when aestivation is over and the eggs hatch, it therefore has a good start before any parasite reappears. The introduction of a rapid-breeding foreign parasite that could survive the dry season or could be maintained in the laboratory would be of great value in checking the first generation.

Reference is made to the initiation of a study of the parasites and predators of the froghopper [*cf. R.A.E.*, A, ix, 262 ; xix, 120, etc.], a report on which is to be published.

CLEARE, jr. (L. D.). **The Rice Caterpillar.**—*Agric. J. Br. Guiana*, iv, no. 1, pp. 26–29, 4 figs. Reprinted as *Ent. Circ. Dept. Agric. Br. Guiana*, no. 3, 4 pp., 4 figs. Georgetown, March 1931.

Outbreaks of *Laphygma frugiperda*, S. & A., all stages of which are described, occur on rice in British Guiana almost every year towards the beginning of the wet seasons, between February and April and again in November. The damage caused occurs in the nursery beds when the plants are only a few inches in height, the young caterpillars attacking the green tissues of the leaves and later consuming the whole leaf or biting it through near the base so that it falls. An entire nursery may be destroyed in this way. By flooding the beds to such a height that the plants are covered, the larvae will be dislodged from the plants and float on the surface of the water, whence they can be collected and destroyed. Collection is facilitated by the use of a light long-handled broom. Co-operation in this work is necessary ; otherwise the caterpillars will pass from one nursery to another. Grass and weeds, on which they feed, should be cleared from the ground round the rice beds.

Papers noticed by Title only.

Clausen (C. P.). **Biological Notes on the Trigonalidae (Hymenoptera)** [*Poecilogonalos maga*, Teran., *P. thwaitesii*, Westw., and *Orthogonalos debilis*, Teran.].—*Proc. Ent. Soc. Wash.*, xxxiii, no. 4, pp. 72–81, 2 figs., 2 refs. Washington, D.C., April 1931. [*Cf. R.A.E.*, A, xvii, 360.]

Compere (H.). **The African Species of *Baeoanusia*, an Encyrtid Genus of Hyperparasites (Hymenoptera)** [*B. oleae*, Silv., and *B. minor*, Silv. (*africana*, Gir.).]—*Univ. Calif. Pub. Ent.*, v, no. 13, pp. 257–264, 3 figs., 1 ref. Berkeley, Cal., 2nd April 1931.

Mann (H. H.) & Burns (W.). **The Locust Attack of 1926-27 in Sind, Kathiawar and Gujarat.**—*Proc. Bd. Agric. India, Pusa, 1929*, pp. 116–124. Calcutta, 1931. [See *R.A.E.*, A, xvi, 166.]

[Pelaghias (C. G.).] **Species of Locusts and Grasshoppers found in Cyprus.**—*Cyprus Agric. J.*, xxv, pt. 1, p. 28. Nicosia, Cyprus, January 1930. [Recd. 1931.] [*Cf. R.A.E.*, A, xix, 82.]

Vos (H. [C.C.A.A.]). **Ueber den Einfluss von *Pseudococcus citri* (Risso) Fern. auf die Nährpflanze.** [The Influence of *P. citri* on the Food-plant.]—*Gartenbauwiss.*, iv, no. 2, pp. 159–168, 13 figs. Berlin, 1930. [*Cf. R.A.E.*, A, xviii, 296.]

Goux (W.). **Notes sur les Coccides (Hem. Coccidae) de la France. II. Contribution à l'étude des *Eriococcus* de la France.**—*Bull. Soc. zool. Fr.*, lvi, no. 1, pp. 58–75, 9 figs., 13 refs. Paris, 6th May 1931.

Kuwana (I.). **Scale Insects of Amamioshima, with Descriptions of four new Species.** [In Japanese, with descriptions of new species in English.]—*Dobuts. Zasshi*, xliii, pp. 163–171, 4 figs. Tokyo, 1931.

Murayama (J.). **A Contribution to the morphological and taxonomic Study of Larvae of certain May-beetles** [Scarabaeoidea] **which occur in the Nurseries of the Peninsula of Korea.**—*Bull. For. Expt. Sta. Chosen*, no. xi, 108+iv pp., 17 pls., 6 tables, 83 refs. Keijo, 1931.

Bruck (C. R.). **Two new Species of Bark Beetles of the Genus *Phloeosinus* Chapuis (Coleoptera, Scolytidae).**—*Pan-Pacific Ent.*, vii, no. 3, pp. 126–128, 1 ref. San Francisco, Cal., January 1931.

Ellinger (T.) & Chorine (V.). **Comparaison de la résistance du maïs sud-africain et du maïs américain à l'infection par la pyrale du maïs** [*Pyrausta nubilalis*, Hb.].—*Ann. Inst. Pasteur*, xlvi, no. 4, pp. 480–481, 2 refs. Paris, April 1931. [See *R.A.E.*, A, xix, 151.]

Katsumata (K.). **The Period of each larval Instar of *Chilo simplex*, Butl.** [*In Japanese.*]—*J. Plant Prot.*, xviii, pp. 236–242. Tokyo, 1931.

Roark (R. C.). **An Index of patented Mothproofing Materials.**—125 pp. mimeographed. [Washington, D.C.] U.S. Dept. Agric., Bur. Chem. & Soils, May 1931.

Leach (J. G.). **Further Studies on the Seed-corn Maggot** [*Phorbia cilicrura*, Rond.] **and Bacteria with special Reference to Potato Blackleg.**—*Phytopathology*, xxi, no. 4, pp. 387–406, 14 figs., 11 refs. Lancaster, Pa., April 1931. [For Abstract see *R.A.E.*, A, xviii, 219.]

van Poeteren (N.). **De Plantenziektenkundige Dienst in Nederland.** [The Phytopathological Service in Holland.]—*Verslag. Plantenziektenk. Dienst*, no. 36, 2nd revd. edn., 66 pp., 12 figs. Wageningen, March 1931. [*Cf. R.A.E.*, A, xiii, 212.]

Urich (F. W.) & Pickles (A.). **Studies in the Incubation of the Eggs of the Sugar-cane Froghopper,** *Tomaspis saccharina* **Dist.—i. Eggs laid in Blotting Paper. ii. Eggs laid in Soil.**—*Min. Proc. Froghopper Invest. Comm. Trinidad & Tobago*, pt. xviii, pp. 64–70, 6 refs., 4 diag. ; pt. xx, pp. 253–255, 3 diag. Trinidad, 1930–31.

Owing to the irregularity of the hatching of the eggs of *Tomaspis saccharina*, Dist. (sugar-cane froghopper) in Trinidad, which has been observed by many investigators, a study was undertaken during 1928 and 1929 by F. W. Urich, F. Hardy and G. Rodriguez. A method of obtaining oviposition on blotting-paper is described, and the incubation of 8,585 eggs laid in this manner was observed. From the data obtained, which are indicated in graphs, an explanation of the demarcation and sequence of broods in the field is suggested. There is an accumulation of eggs at the end of the dry season, which have been arrested in development owing to drought conditions. As soon as conditions are favourable for development, wholesale hatching occurs and a clearly-defined first generation of froghoppers appears. The eggs laid by them were deposited in July and differed from all the others in that hatching was completed in less than 50 days, the greater part of them hatching about the 20th day. These eggs give rise to a second brood, which is clearly defined, though slightly less so than the first. A proportion of the eggs of all other broods required 150–215 days for complete development. Only some 50 per cent. of the eggs laid by the second brood can give rise to a third under the most favourable conditions ; some will remain dormant at least until well into the dry season (January-March), probably until the next rainy season, under the influence of drought. The second and third generations are each the progeny of the immediately preceding one only, whereas the first generation and inter-season individuals are of mixed parentage. Some of the third generation may give rise to a fourth, augmented by belated progeny of the second generation. If much rain occurs during the dry season, there will be continuous irregular hatching of nymphs throughout the period, but it seems evident that there is some environmental or internal factor, besides lack of humidity, that controls long-period development.

Further laboratory investigations with soil as a medium for incubation, the results of which are summarised in graphs, very definitely supported the main conclusions derived from the blotting-paper cultures, any slight disparity in the hatching curves being probably due to inequalities in the soil humidity or to a new factor introduced by the soil. There seems to have been no mention of the definite intrinsic physiological difference between the eggs of the first and later broods, leading in the latter case to the "long periodism" phenomenon, in the literature of other Cercopid species. Observations indicate that it occurs also in *Tomaspis basalis*, Wlk., from Jamaica, but, on the other hand, *T. pubescens*, F., apparently has no long-period eggs. The latter species frequents very moist localities where drought conditions are rare, and there is complete demarcation of the broods with no overlapping ; between successive broods there is a short period when only eggs can be found, and for a short time prior to the emergence of adults there are no eggs. These facts are of great significance in a consideration of the availability of hosts for purposes of biological control.

(19119) Wt P2/3550 1,700 8/31 H & Sp Gp 52

Cleare, jr. (L. D.). **Modifications in the Rearing and Distribution of Egg Parasites of *Diatraea* in British Guiana.**—*Agric. J. Br. Guiana*, iv, no. 1, pp. 40–42, 3 refs. Georgetown, March 1931.

Certain modifications of the method of rearing the egg parasites, *Trichogramma minutum*, Riley, and *Prophanurus alecto*, Cwfd., for use against the sugar-cane moth borers, *Diatraea* spp. [*R.A.E.*, A, xvi, 652], which are described in this paper, have been devised by H. W. B. Moore and by H. E. Box. Moore has dispensed with the parasite rearing boxes and uses drinking tumblers about 5½ ins. high with a diameter of 3¼ ins. covered with a piece of paper held in place by means of a string. In these glasses parasitised egg-masses are placed some days previous to emergence of the parasites, and when emergence has occurred, strips of dried cane leaves bearing egg-masses for parasitism are inserted and placed erect, the paper being tapped sharply to cause any parasites that might escape to fall to the bottom. Parasites may be liberated in the field directly from the glasses on fine days, but if there is any indication of rain the glass, instead of being placed erect, should be laid on its side with the opening away from the direction of the prevailing wind. Another method consists of placing parasitised egg-masses, with an attached piece of leaf, in 4-oz. cylindrical cigarette tins, which are hung, with the open ends up, by means of hooks about 1 in. long, beneath pieces of galvanised iron sheet about 7 ins. square attached to light bamboo rods erected in the field. These should be set up in one of the larger drains or at the edge of one of the cross canals, or even in a dry drain if grease is smeared near the bases to keep off ants, and in hot weather a layer of dry trash should be tied over the galvanised iron sheets and over the tins containing the egg-masses. They should not be put into the fields until the day before the parasites are expected to emerge, so that there is as little opportunity as possible for ants, etc., to attack them.

Gattoni D. (L. A.). **El peligro del *Margarodes vitium* en los viñedos de una de las mejores zonas frutícolas.** [The Danger of *M. vitium* in the Vineyards of one of the best Fruit-growing Districts of Ecuador.]—*Rev. Dept. Agric. Ecuador*, i, no. 1, pp. 16–19. Quito, March 1931.

Injury to vines, thought to be due to *Margarodes vitium*, Giard, is recorded in three vineyards in the valley of Patate, Ecuador.

Wille (J.). **Der Kokastrauch und seine Kultur in der "Montaña" sowie über die Kokaverwendung in Peru.** [The Coca Shrub and its Cultivation in the Montaña Region and the Use of Coca in Peru.]—*Tropenpflanzer*, xxxiv, no. 3, pp. 99–109, 2 figs., 10 refs. Berlin, March 1931.

Coca (*Erythroxylon coca*) is grown chiefly in the Montaña region of Peru east of the Andes, and the crop, which is of great value, is very much reduced by the Tineid, *Eucleodora cocae*, Busck, and the Lymantriid, *Eloria* (*Penora*) *noyesi*, Schaus. The former occurs from April to August, injuring up to 40 per cent. of the crop, and the latter, which is especially prevalent from December to April, causes damage that varies considerably in extent but sometimes amounts to 50 per cent. Both species, which come from neighbouring forests, attack the mature leaves and the young shoots, sometimes killing the plants.

They may be readily controlled by arsenical dusts, and if treatment is stopped three weeks before plucking, the heavy tropical rains wash off all traces of the poison before harvest.

A leaf-cutting ant, *Acromyrmex hispidus*, Santschi, is particularly dangerous to the young plants.

WARBURTON (C.). **Annual Report for 1930 of the Zoologist.**—*J.R. Agric. Soc. England*, xci, pp. 332–341. London, 1930.

Brief notes are given on some of the insect pests occurring on field crops and fruit and forest trees in England during 1930, with special reference to the flea-beetles (*Phyllotreta*) attacking turnips and to Newton's investigations on them [*R.A.E.*, A, xvi, 615–617].

SMITH (K. M.). **Studies on Potato Virus Diseases. IX. Some further Experiments on the Insect Transmission of Potato Leaf-roll.**—*Ann. Appl. Biol.*, xviii, no. 2, pp. 141–157, 1 pl., 5 figs., 17 refs. Cambridge, May 1931.

The following is largely taken from the author's summary: Experiments bearing on a possible relationship between the virus of potato leaf-roll and the Aphid vector, *Myzus persicae*, Sulz., are described. It was found that a non-infective Aphid can pick up the virus of leaf-roll from an infected potato plant after feeding for 6 hours and that an infective Aphid can transmit the virus to a healthy potato plant after feeding for 2 hours, but the whole process whereby the Aphid contracts infection from a diseased plant and transmits it to a healthy one cannot be performed in 8 hours; a minimum period of 54 hours appears to be necessary. The incubation period of the virus in the plant, *i.e.*, the time from infection to the appearance of the first symptoms, averaged 14 days under the conditions of experiment. Leaf-roll, which is not normally transmitted by needle inoculation, is also not transmissible by needle-inoculation of the body juices of infective Aphids. Infections of series of healthy plants showed that the infective individuals of *M. persicae* were capable of infecting 6, 7 and 10 plants in succession without again having access to the source of infection. Occasionally some plants in the series failed to contract the disease although others before and after them were successfully infected. The leaf-roll occurring in American varieties of potato is as easily disseminated by *M. persicae* as the leaf-roll virus in the British Isles. Transmission experiments were also made with the three other Aphids common on potato in Britain, *viz.*, *Myzus solani*, Kalt. (*pseudosolani*, Theo.), *Macrosiphum gei*, Koch, and *Aphis rhamni*, Boy. (*solanina*, Pass., *abbreviata*, Patch), as well as with *A. gossypii*, Glov., and *Myzus circumflexus*, Buckt., which are greenhouse Aphids, but positive results were only obtained with the two species of *Myzus*. The characters distinguishing the four potato Aphids and *M. circumflexus* are described and illustrated.

TATTERSFIELD (F.) & HOBSON (R. P.). **Extracts of Pyrethrum: Permanence of Toxicity and Stability of Emulsions.**—*Ann. Appl. Biol.*, xviii, no. 2, pp. 203–243, 5 diag., 11 refs. Cambridge, May 1931.

The active principles of pyrethrum have been shown to be esters [*R.A.E.*, A, xiii, 298] that are liable to decomposition or chemical

change detrimental to their insecticidal action. The careful choice of solvents and emulsifiers is therefore of importance, and in this paper an account is given of investigations of the problem of preparing mixtures in which the toxic principles are stable and from which sufficiently stable emulsions can be made.

The following is the authors' summary: Pyrethrum flowers (*Chrysanthemum cinerariaefolium*), both as whole heads and as powder, retain their insecticidal properties at ordinary temperatures and at 28° C. [82·4° F.] for considerable periods if stored in closed vessels. If exposed to the atmosphere in a thin layer as finely ground powder, there is risk of loss of toxicity.

Alcohol and petroleum extracts of pyrethrum retain their toxicity in temperate climates over many months. Alcohol extracts readily give permanent emulsions when added to water; petroleum extracts require the incorporation of an emulsifier. Water-miscible petroleum extracts of pyrethrum can be prepared by the addition of certain materials, such as ammoniated Agral W.B. and neutral turkey-red oil.

A study has been made of the degree of permanence of the active principles in alcoholic and water-miscible petroleum extracts at ordinary British temperatures and at 28° C. and also in emulsions of these extracts in alkaline spray fluids of varying pH. The active principles proved more permanent than has been usually supposed. The readiness with which water-miscible petroleum extracts disperse in the aqueous phase and the stability of the emulsions formed under a variety of conditions have been investigated.

FAVARD (P. G.). **L'Altise de la vigne.**—*Prog. agric. vitic.*, xcv, no. 22, pp. 513–514. Montpellier, 31st May 1931.

This is a popular account of *Haltica ampelophaga*, Guér., on vines in the south of France. Oviposition begins in the spring and may continue for two months, which has given rise to the belief that several generations occur in a year, though in reality there are only two. The usual remedial measures are advocated.

WERTH (E.) & others. **Krankheiten und Beschädigungen der Kulturpflanzen im Jahre 1928.** [Diseases and Injuries of cultivated Plants in 1928.]—*Mitt. biol. Reichsanst. Land- u. Forstw.*, no. 41, 64 pp., 27 maps, 2 figs. Berlin, April 1931.

This report contains annotated lists of the insect pests recorded in Germany in 1928, divided according to the class of crop attacked.

SIMON (—). **Ein Massenauftreten der Getreidehalmwespe im Jahre 1930 im Nördlinger Ries und Untersuchungen über die verursachten Schäden.** [An Outbreak of *Cephus pygmaeus* in 1930 in the Nördlinger Ries District and Investigations on the Losses caused.]—*Prakt. Bl. PflBau u. PflSchutz*, ix, nos. 1–2, pp. 9–12, 34–41, 7 figs. Freising, April, May 1931.

A popular account is given of an outbreak of *Cephus pygmaeus*, L., in a district of Bavaria, with a report of investigations, based on comparisons between infested and uninfested stems, on the losses caused, which are estimated at about £7,500 for wheat, and £4,500 each for rye and barley.

SALING (T.). **Die Bedeutung des T-Gases (Aetox) für die Bekämpfung von Gesundheits-, Wohnungs- und Vorratsschädlingen.** [The Importance of T-Gas (Aetox) for the Control of Household and Stored Product Pests.]—*Z. Desinfekt.*, xxiii, no. 4, pp. 171–175. Dresden, April 1931.

A mixture of ethylene oxide and carbon dioxide as a fumigant [*cf. R.A.E.*, A, xviii, 408, 647] has been prepared in liquid form in Germany under the name of T-gas. In official tests with it at a strength of ethylene oxide gas of 1·6 volumes per cent. (equal to 32 oz. C_2H_4O to 1,000 cu. ft.), all mammals were killed, and all Arthropods died after 5 hours' fumigation, with the exception of *Tribolium navale*, F., of which most individuals died during 24 hours' exposure or in the 2 days following, though a few were alive 10 days later. The smell of the gas remains for days, but appears to be harmless. Fabrics, carpets and metals were undamaged after several fumigations, though a fine, greasy deposit occurs on exposed surfaces.

FALCK (R.). **Die Scheindestruktion des Koniferenholzes durch die Larven des Hausbockes** (*Hylotrupes bajulus* **L.**). **I. Mitt.** [The apparent Destruction of Coniferous Timber by the Larvae of *H. bajulus*.]—*Zellulosechemie*, xi, 1930, pp. 89–91; Beilage zu *Papierfabrikant*, xxviii, 1930. (Abstract in *Zbl. Bakt.*, (2) lxxxiii, no. 15–22, p. 378. Jena, 23rd April 1931.)

Comparative analysis of the frass and of sound timber has shown that the larvae of *Hylotrupes bajulus*, L., remove from the wood of conifers about 21 per cent. of the total cellulose and hemi-cellulose.

BODENHEIMER (F. S.). **Zur Frühgeschichte der Erforschung des Insektenparasitismus.** [A Contribution to the early History of the Investigation of Parasitism in Insects.]—*Arch. Gesch. Math. Naturw. Techn.*, xiii, no. 3–4, pp. 402–416. Berlin, 1931.

This is a survey of early records of observed cases of insects parasitising other insects. By about 1700 a correct conception of the nature of this phenomenon existed. Two later notes by Réaumur and De Geer are reproduced.

MENOZZI (C.). **Informazioni sui danni causati da insetti alla barbabietola durante la campagna saccarifera 1930 e sulla lotta contro di essi.** [Information on the Damage caused by Insects to Beet during the Sugar-beet Season of 1930 and on their Control.]—*Indust. saccarif. ital.*, xxiv, no. 2, reprint 7 pp. Genoa, February 1931.

The chief pests of sugar-beet in Italy in 1930 were *Conorrhynchus* (*Cleonus*) *mendicus*, Gyll., *Chaetocnema tibialis*, Ill., *Cassida vittata*, Villers, *C. nobilis*, L., and *Pegomyia hyoscyami*, Panz. *C. nobilis* has not hitherto been recorded as a beet pest in Italy. *Rondania dimidiata*, Mg., the Tachinid parasite of *Conorrhynchus mendicus* [*cf. R.A.E.*, A, xviii, 561] was found attacking the adults of another weevil, *Larinus scolymi*, Oliv., in September. The larvae leave this host in order to hibernate in the ground as pupae. Pupae of *R. dimidiata* thus obtained from this new host will be distributed in 1931 in fields infested by

C. mendicus. The losses due to *Cassida* spp. were much less than in 1929, owing to extensive spraying with lead arsenate. *P. hyoscyami* has three generations a year in the north of Italy, and four in the centre. *Opius ruficeps*, Wesm., was bred from the pupae, and *Trichogramma evanescens*, Westw., from the eggs. The only satisfactory measure was spraying with 0·25 per cent. nicotine sulphate when the larvae first appeared, and it is thought that two applications at an interval of ten days should be sufficient.

Šámal (J.). **Dva zajímaví škůdcové našich poživatin.** [Two interesting Pests of stored Products in Czechoslovakia.] [*In Czech.*]—*Čas. českoslov. Společn. ent.*, xxvii, no. 5–6, pp. 100–101. Prague, December 1930. [Recd. June 1931.]

Brief notes are given on *Ptinus fur*, L., found in numbers infesting powdered paprika pepper [*Capsicum*] [*cf. R.A.E.*, A, xviii, 187], and *Plodia interpunctella*, Hb., attacking walnut kernels. In the author's experiments *Ptinus* had one generation a year. In the laboratory the larvae pupated in cocoons on 8th October, and the adults emerged in the beginning of the following April. *P. interpunctella*, the larvae and adults of which are briefly described, had 3–4 generations a year, though only 2 have been recorded in the literature as occurring in Czechoslovakia.

Pęska (W.). **Obserwacje nad biologją dzióbalka gajowego** (*Anthocoris nemorum* **L.**). [Observations on the Biology of *A. nemorum.*]—*Prace Wydz. Chorób Roślin państw. Inst. nauk. Gosp. wiejsk. Bydgoszczy* [*Trans. Dept. Plant Dis. St. Inst. Agric. Bydgoszcz*], no. 10, pp. 53–71, 4 pls., 22 refs. Bydgoszcz [Bromberg], 1931. (With a Summary in German.)

An account is given of observations in the summer of 1929 in western Poland on the bionomics of the predacious bug, *Anthocoris nemorum*, L. It was found in numbers on apple trees attacked by *Anthonomus pomorum*, L., in the web-nests of *Hyponomeuta* on *Prunus padus*, and on all kinds of trees and bushes infested with Aphids or other pests, and fed readily on a variety of Aphids in the insectary, individual bugs killing from 418 to 665 Aphids. The eggs and the immature stages are described in detail. There are two overlapping generations a year, all stages being found from mid-May till the end of June. Hibernation takes place in the adult stage under the bark of the trees or in any available shelter on the ground. Oviposition begins early in April, 4–5 days after pairing, the eggs being laid singly on leaves and partly embedded in the lower or upper surface, or on the pistils and stamens of flowers. A female deposits on an average 3–4 eggs a day, the total number varying from about 55 to 200 in the spring and 40 to 100 in summer. The eggs hatch in 6–7 days at a temperature of 18–20° C. [64·4–68° F.], and nymphal development, including five instars, requires 26–34 days. During the moulting period the nymphs are very susceptible to changes in temperature and other unfavourable conditions; in the insectary many died just before or soon after moulting. The adults of the first generation chiefly oviposit in June and July, though individuals may do so as early as the second half of May, or as late as the end of August. All the adults of the second generation enter hibernation.

[SHCHEPKINA (T. V.).] **Щепкина (Т. В.). Die Zufuhr von verschiedenen Salzen in den Boden als Mittel zum Schutz der Pflanzen gegen** *Oscinosoma frit*. [The Introduction of various Salts into the Soil as a Means of protecting Plants against *Oscinella frit*.] [*In Russian*.]—*Morbi Plantarum*, xix, no. 1–2, pp. 69–79, 2 figs., 2 diag., 8 refs. Leningrad, 1930. (With a Summary in German.) [Recd. June 1931.]

This paper is supplementary to one already noticed [*R.A.E.*, A, xviii, 239] and deals with laboratory experiments on the effect of such artificial manures as nitrogen and phosphorus pentoxide on barley infested by *Oscinella* (*Oscinosoma*) *frit*, L. They confirm the observation that the amount of damage caused by the fly depends on the age of the plant, and that infestation of the more mature ones has actually a favourable effect on their ultimate yield. The intensity of growth of the infested plants and of the development of heavier and larger grain resulting from the presence of the larvae largely depends on the application to the soil of salts containing nitrogen or phosphorus. No supernumerary shoots were produced by the plants after infestation, if the dosage of nitrogen or phosphorus had been increased to 1·4 or 2 times the normal amount respectively; the uninfested stems developed normally, and the ripening of the grain was not retarded, as in the case of profuse tillering. The ultimate crop was increased by 20–40 per cent. when the infestation was late. In any case, though the manures do not protect the plants from infestation by the fly, the damage it causes is considerably decreased.

[NESTERCHUK (G. I.).] **Нестерчук (Г. И.). Die Wälder des Karelien-Murman Gebiets und ihre Schädlinge.** [The Forests of the Karelian-Murman Region and their Pests.] [*In Russian*.]—*Morbi Plantarum*, xix, no. 3–4, pp. 159–182, 7 figs., 11 refs. Leningrad, 1930. (With a Summary in German.) [Recd. June 1931.]

Notes are given on various fungi and insect pests observed on conifers and deciduous trees in the forests of the Kola peninsula and the coast of the Karelian Republic, where their development is greatly encouraged by the presence of a large amount of slash and by devastating fires in the areas adjoining the railway. The climatic conditions of the region and the character of the forests are briefly discussed, and a list is given of 110 species of injurious insects, with indication of their distribution, the trees they infest and the part attacked. Constant foci of infestation are formed in dense growths where the branches of trees die off owing to the lack of light, and by tree tops that dry out as a result of unfavourable climatic conditions. Of the more important species, *Melolontha melolontha*, L., occurred in southern Karelia only. *Ips bidentatus*, Hbst. (*Pityogenes bidens*, F.), which was found on pine in southern Karelia, attacked spruce as well in the Kola peninsula. *Hylobius abietis*, L., which is very abundant on pines, is rapidly spreading to new areas. *Myelophilus* (*Blastophagus*) *piniperda*, L., defoliated in some localities 70–82 per cent. of the branches and twigs of pines. Supplementary maturation feeding was observed in the case of the adults of the Cerambycid, *Pachyta lamed*, L., which damage the needles of pine and spruce, a fact hitherto not recorded in the literature, but confirmed by laboratory observations. *Dendroc-*

tonus micans, Kug., which occurs in the Kola peninsula in mixed stands of pine and spruce and usually attacks almost healthy spruces, was found infesting the lower part of the trunks and the upper parts of the roots of pines. The finding on pines of *Ips subelongatus*, Motsch., and *Dryocoetes baikalicus*, Reitt., which usually infest larch, suggests the possibility that this tree used to occur on the peninsula, but disappeared owing to fires and the action of man.

[DIAMANDIDI (M. K.).] **Диамандиди (М. К.). On the Biology of *Phylloxera* under the Conditions of the Forest-Steppe Zone of Moldavia.** [*In Ukrainian.*]—*Arb. wiss. Centralversuchssta. Weinbau Odessa*, ii, pt. 1, pp. 193–205, 9 refs. Odessa, 1930.

An account is given of observations on *Phylloxera* carried out in 1927 and 1928 in the Moldavian Republic (on the eastern bank of the river Dniester), where both root and leaf forms are present on vines. The depth at which the Aphids occurred in the soil varied from 6 to 30 ins., the majority being found between 10 and 15 ins. All those occurring at less than 16 ins. were killed by the severe winter of 1927–28, and it is suggested that —1° C. [30·8° F.] is probably the minimum soil temperature that they can resist for a period of 3–4 months. Laboratory observations showed that the root form has five complete generations a year, individual generations developing in from 25 to 40 days. The second generation produced the maximum number of eggs, and the fifth, which was also the least numerous, the minimum. Hibernation of the larvae usually starts in the third generation, though if feeding conditions are unfavourable some even of the second may hibernate. Only the first instar larvae overwintered, and exclusively on woody roots, hibernation taking place in the layers of the soil in which they occurred, no migration to lower layers being observed. The third instar larvae of the third and fourth generations produced nymphs on the roots of the hybrids in a nursery of American vines, and alate individuals occurred from the end of August till mid-October ; the latter did not survive in the laboratory, and no eggs produced by them were found.

The leaf form of *Phylloxera* produced six generations a year, the eggs laid being two or three times as numerous as those deposited by the root form. Galls occurred on the leaves from mid-July till the end of September or beginning of October. Those formed by the second and third generations contained 50 and 62 per cent. respectively of the larvae of the root form, and the sixth generation produced the root form only.

[FILIP'EV (N.).] FILIPJEV (N.). **Lepidopterologische Notizen. XIII. Ein neuer Weintraubenschädling aus der Gattung *Ephestia* Gn.** [Notes on Lepidoptera. XIII. A new Pest of Grape Vines of the Genus *Ephestia*.]—*Iris*, xlv, no. 2, pp. 70–73, 9 figs. Dresden, 26th June 1931.

Ephestia vitivora, sp. n., is recorded on grape vines in Transcaucasia. *Lithocolletis populi*, n. n., is proposed for *L. populiella*, Filip. nec Chamb. [*R.A.E.*, A, xv, 313].

[Tzuigankov (—), Orlov (—) & Golovizin (—).] **Цыганков (—), Орлов (—) и Головизин (—). Preliminary Report on the Use of Aeroplanes in the Control of Acrididae under the Conditions of Central Asia.** [*In Russian.*]—*Khlopkovoe Delo*, ix, no. 12, pp. 1366–1370. Tashkent, December 1930.

This is a discussion of the advantages of using aeroplanes for broadcasting poison baits for the control of locusts and grasshoppers in Central Asia, including economy in labour and time and the possibility of effecting control in otherwise inaccessible breeding places. Experiments in 1930 [*R.A.E.*, A, xix, 371] have proved that aeroplanes of certain makes may be effectively used for broadcasting moist or dry poisoned baits, the average width of the swath obtained being 160 ft. by flying at a height of 160 ft. Strips of dry bait in an open steppe are distributed extremely evenly, and in six hours it is possible to apply more than six tons of bait over an area of about 900 acres.

Chen (H. T.). **Biological Notes on a Chrysomelid Pest of Bamboo.**—*Lingnan Sci. J.*, vii (1929), pp. 515–529, 1 pl. Canton [1931].

An account is given of the results of observations during 1927 and 1928 on an unidentified Chrysomelid, all stages of which are described in detail, infesting various species of bamboo near Canton. It has one generation a year, the winter being passed in the adult stage. The egg, larval and pupal stages averaged 8, 19 and 9 days respectively. Both the larvae and adults skeletonise the leaves, but the larvae feed on the upper and the adults on the lower surfaces. The eggs, which are laid on the leaves, were first found early in April, and the oviposition period lasted until mid-June.

Snyder (T. E.). **Termites, Destroyers of Wood, and Man's Fight against them.**—*Lingnan Sci. J.*, vii (1929), pp. 531–580, 4 figs., 11 pls., 16 refs. Canton [1931].

A general account is given of termites, with particular reference to their control in buildings [*cf. R.A.E.*, A, xiii, 277; xviii, 114; xix, 224, etc.], and lists of the species occurring in China and in Indo-China are appended.

Light (S. F.). **Present Status of our Knowledge of the Termites of China.**—*Lingnan Sci. J.*, vii (1929), pp. 581–600. Canton [1931].

Previous papers on the termites of China are briefly reviewed, and notes are given on the classification of the species occurring there, including descriptions of certain forms and keys to the adults and soldiers of the Asiatic species of *Reticulitermes*. Instructions for the preparation of slides for the study of protozoa occurring in the hind intestine of termites are appended.

Needham (J. G.). **Insect Inhabitants of the fruiting Sprays of the Pagoda Tree,** *Sophora japonica*.—*Lingnan Sci. J.*, vii (1929), pp. 601–611, 1 pl., 1 ref. Canton [1931].

Notes are given on insects found on or in the fruiting sprays of *Sophora japonica*, which is used as a shade tree in North China. These include *Cydia* (*Laspeyresia*) *trasias*, Meyr., *Leucoptera substrigata*, Meyr., a

seed-eating Chalcidoid (? *Bruchophagus* sp.), which was the most injurious of the insects observed, and a number of other unidentified species.

PIERCE (W. D.). **Some Principles useful in solving economic biological Problems.**—*Lingnan Sci. J.*, vii (1929), pp. 625–631. Canton [1931].

The author discusses some of the basic principles to be considered in attempts to solve problems of the control of injurious insects in the Orient, with particular reference to the interplay of biological and environmental factors on living organisms. The necessity for keeping an accurate status record of progress toward the solution of the problem is pointed out, since without such information, extraneous unconsidered factors may greatly alter or negative the results. As an example, the cultural, mechanical, chemical and biological methods that may be employed in the control of pests of sugar-cane are outlined, and the importance of a study of the various factors influencing the incidence of the pests in the field is pointed out.

WALL (R. E.). **A Study of** *Brachyplatys subaeneus* **Westw.**—*Lingnan Sci. J.*, vii (1929), pp. 633–649, 1 pl., 1 ref. Canton [1931].

An account is given of observations conducted in the field and the laboratory near Canton on the bionomics of the Plataspid bug, *Brachyplatys subaeneus*, Westw., and all stages of it are described and figured. It has not been observed feeding on any plants other than cultivated beans, of which introduced varieties are preferred. All stages were observed in the field from June to October, and a few adults and late instar nymphs from October to December, but none could be found during the winter (January-April). Individuals were kept in cages in the open, however, throughout this period and did not at any time become completely inactive. In the insectary, egg-laying began early in April and continued until mid-January. Mating occurred frequently, but females continued to lay fertile eggs for as long as 30 days after the removal of the males. The eggs are deposited in batches of 25–35 at intervals of a few days. The egg, nymphal and preoviposition periods averaged 6, 40 and 17 days respectively, the adults living for 2 months or more according to climatic conditions. The parasite recorded in a previous paper [*R.A.E.*, A, xviii, 338] as infesting the eggs has now been identified as the Scelionid, *Dissolcus tetartus*, Cwfd.

GREEN (E. E.). **Two new Mealy Bugs from India.**—*Ann. Mag. Nat. Hist.*, (10) vii, no. 42, pp. 557–560, 2 figs. London, June 1931.

Descriptions are given of *Ripersia oryzae*, sp. n., taken on rice, wild grasses and sedges, and *Rhizoecus cynodontis*, sp. n., on the roots of *Cynodon dactylon*.

SINGH (Karam). **A Contribution towards our Knowledge of the Aleyrodidae (White Flies) of India.**—*Mem. Dept. Agric. India*, Ent. Ser., xii, no. 1, pp. 1–98, 37 pls., 6 pp. refs. Calcutta, April 1931.

This revision of the Aleurodids of India includes numerous keys, with descriptions of various forms and notes on the bionomics of some

of them. The 23 new species described include *Dialeurodes pallida* on betel (*Piper betle*); *D. vulgaris* on seedlings of *Eugenia jambos*, etc.; *Pealius misrae* on guava; *Trialeurodes bicolor* on *Eugenia jambos*; *Aleurotrachelus rachipora* on *Cassia fistula, Euphorbia pilulifera, Bauhinia* sp. and *Dalbergia sissoo*; *A. coerulescens* on *Artocarpus integrifolia*; *A. psidii* on guava; *A. murrayae* on *Murraya exotica*; *Aleurocanthus simplex* on banyan (*Ficus bengalensis*); *A. rosae* on *Rosa* sp.; *A. rugosa* on *E. jambolana*, betel, guava, etc.; *Aleurothrixus indicus* on fig, etc.; and *Aleurotulus arundinacea* on bamboo.

PESCOTT (R. T. M.). **The Oriental Peach Moth, a serious Pest in the Goulburn Valley.**—*J. Dept. Agric. Victoria*, xxix, pt. 4, pp. 173–176, 5 figs., 3 refs. Melbourne, April 1931.

Cydia (*Laspeyresia*) *molesta*, Busck, an account of the bionomics of which is given, has been causing severe injury to late peaches in Victoria for several years, but has only recently been identified. The damage was first attributed to the codling moth [*Cydia pomonella*, L.], particularly because it only occurred to any extent after the early varieties of peaches had been harvested, and since the injury was most severe to peaches that were adjacent to pears. It was originally thought that the only plants attacked by *C. molesta* were peaches and the various cultivated species of *Prunus*, namely cherry, plum, apricot, and the flowering cherries, but quite recently it has been found that the quince and apple are as readily attacked as the peach. Brief reference is made to American literature showing the difficulty of controlling this moth.

ANDREWARTHA (H. G.). **The Apple Curculio.**—*J. Dept. Agric. W. Australia*, (2) viii, no. 1, pp. 106–114, 4 figs. Perth, W.A., March 1931.

An account is given of the bionomics in Western Australia and distribution of *Otiorrhynchus cribricollis*, Gyll., all stages of which are described. The normal life-cycle occupies one year, but some of the larvae, which feed on the roots of weeds, aestivate and some adults hibernate. The adults emerge and begin to feed on apple trees in November-December, first eating chiefly the edges of the leaves and later nibbling the stems of the fruit and leaves, some of which they cut right off. They are inactive during most of January and February, but feed again in autumn, when the greatest damage is done, as they not only eat the leaves but also ringbark the buds and spurs and the stems of the apples. Oviposition occurs from mid-March to early June, and it is essential to apply remedial measures before sexual maturity is reached, that is, during the first period of feeding. Tests indicated that bands of sheepskin, metal [*R.A.E.*, A, xvii, 660] or a proprietary adhesive are of little or no value. As the weevils bury themselves at the base of the tree during the day, calcium cyanide might be applied in or on the soil round the trunk, but would probably have to be repeated so often as to render its use uneconomical. Trap bands of sacking round the bases of the trees have given good results, but the time required for destroying the weevils in them renders them

too expensive. Poisoning is probably the best remedy. For trees not bearing fruit, a spray of 1 lb. lead arsenate to 16 gals. water is recommended, to be applied early in December and repeated 10 days later if necessary. Baits consisting of 9 lb. dried apple to 1 lb. sodium fluoride, which have proved effective in preliminary experiments, can be used for all trees, whether bearing or not. Fowls are of some use in clearing the orchard of weevils.

FOWLER (R.). **Results of experimental Tests for the Control of Codlin Moth as carried on at the Blackwood Experimental Orchard, Season 1929–30.**—*Bull. Dept. Agric. S. Australia*, no. 243, 15 pp., 1 graph. Adelaide, 1930. [Recd. 1931.]

The following is taken largely from the author's summary of the results of 17 spray experiments in South Australia to determine the most effective and economical method for control of the codling moth [*Cydia pomonella*, L.] on apples, and to discover if treatment with summer oils would prove efficacious in view of the problem of arsenical residue on the fruit. In each test 5 applications of the spray were made, except that in one case the calyx spray was omitted, which proved to be inadvisable. Lead arsenate with the addition of a spreader in the last three sprays gave very satisfactory results and lead arsenate alone was only slightly inferior. The arsenical residue was reduced and good results were obtained when the arsenate was followed by three sprays of summer oils. Lead arsenate combined with oil gave the highest degree of control, probably owing to the heavy coverage, but the cost of the oils appears to be almost prohibitive and the residue was most difficult to remove. Oil alone will control *C. pomonella*, but it appears to inhibit to some extent the colour formation of the skin of red apples and causes a certain amount of rustiness.

The season under review was dry, and the oil tended to collect dust on the fruit and foliage. Control by means of arsenical dusts appeared to be unsatisfactory. Detailed results of the spray programmes are given in tables, and the costs of the most important are discussed.

SIMMONDS (H. W.). **Noxious Weeds and their Control in Fiji. Part II —Biological Control.**—*Agric. J. Fiji*, iv, no. 1, pp. 29–31. Suva, 1931.

The author briefly discusses the general principles affecting attempts to control noxious weeds by insects introduced from the natural habitat of the plant and some of the work that has been done in this connection in Fiji [*cf. R.A.E.*, A, xviii, 616, etc.].

UICHANCO (L. B.). **Coal Tar-Kerosene Emulsion and its Uses as an Insecticide.**—*Philipp. Agric.*, xix, no. 8, pp. 501–505, 4 refs. Laguna, P.I., January 1931.

Experiments were carried out in the Philippines to discover a suitable insecticide for dipping sugar-cane setts against pests transported on them and those that attack the very young plant cane. The most satisfactory one is prepared by dissolving 5 lb. laundry soap in 4 gals.

boiling water, adding a mixture of 5 gals. coal tar (without creosote) and 3 gals. kerosene, while the solution is still hot, and beating all the ingredients into a fairly complete emulsion. This combines the insect-repelling qualities of coal tar with the insecticidal properties of kerosene in a form innocuous to certain forms of plant tissues. It should be used at the rate of 1 part by volume to 5–10 parts water and should not be applied to foliage, which is likely to be scorched, nor should it come into direct contact with the plant tissues if the coal tar contains creosote. For treating cane setts it was applied at the rate of 1 : 10 and proved effective against mealybugs and other pests that are difficult to trace owing to their congregating between the leaf sheath and the cane stem, and also in protecting cut ends of the mother plants and the eyes and developing shoots of cane from attacks of termites and other soil-inhabiting insects.

Details of this work are to be published elsewhere, but subsequent experiments indicated that the emulsion has a much wider application. The Melolonthid, *Leucopholis irrorata*, Chevr., was satisfactorily controlled by surrounding the grubs with a trench treated with the emulsion diluted at 1 : 5 at the time of initial appearance of infestation in the field [*R.A.E.*, A, xviii, 651]. The insecticide remained effective for as long as three months, a sufficient time for the sugar-cane to attain enough maturity for harvesting. In 1929, the dead tissues on mango trees resulting from the depredations of the Cerambycid, *Plocaederus fulvicornis*, Guér. (*ruficornis*, Newm.) were cut out, and the trunks and larger branches painted with the emulsion (1 : 5). Though the work was not carried out on a sufficiently large scale to permit definite conclusions, there are indications that the treatment applied at least once a year will protect the trees against re-infestation. The cost of treatment is given in detail. It would also probably be beneficial to cacao infested by bark borers, of which the most injurious species in the Philippine Islands are the Lamiids, *Pterolophia* (*Praonetha*) *bigibbera*, Newm., *Sthenias varius*, Ol., *Niphonoclea* (*Euclea*) *capito*, Pasc., and *N.* (*E.*) *albata*, Newm., the last two having been recorded also on mango and avocado. Preliminary experiments in treating seeds or seed beds against ants indicate that seeds immersed in the insecticide (1 : 10) and drained before planting are immune from attack. Cuttings of ornamental shrubs and certain fruit trees immersed in the emulsion at the same dilution were free from termite attack, and germination was not apparently affected.

Illingworth (J. F.). **Longhorned Grasshopper,** *Conocephalus saltator* **(Saussure), as a Pest of Pineapples in Hawaii.**—*Proc. Hawaii. Ent. Soc.*, vii, no. 3, pp. 407–408. Honolulu, April 1931.

Conocephalus saltator, Sauss., which is predacious on many insects and frequently acts as a check on the mealybug, *Pseudococcus brevipes*, Ckll., in pineapple fields in Hawaii, sometimes appears in such numbers that there is not enough insect food and the hoppers attack the pineapple leaves, gnawing off the tips, and also feeding on the flowers and bracts covering the fruitlets. Investigation showed that eggs are sometimes deposited in the fruits, and when the ovipositor ruptures the floor of the calyx cavity fungi gain an entrance to that part of the fruit. The dry rot characteristic of the condition known as Kauai disease may result.

Illingworth (J. F.). *Tarsonemus ananas*, **Tryon, a Mite that is becoming a serious Pest of Pineapples in Hawaii.**—*Proc. Hawaii. Ent. Soc.*, vii, no. 3, pp. 409–410. Honolulu, April 1931.

During an investigation of Kauai disease of pineapples in 1929, several species of mites were found in the calyx cavities. One of these, *Tarsonemus ananas*, Tryon, causes a condition that seems identical with the Kauai disease, which is a dry rot affecting one or more of the eyes of the fruit. As the fruit increases in size, it becomes distorted owing to the dry, dead area, which usually cracks open, the dry cavities being coated with spores of the fungus, *Penicillium*. Inside the calyx cavities on diseased fruits, there is considerable evidence of the work of the mites. When the fruit buds first form, the mites congregate between the leaf scales of the tops, and later they migrate to the calyx cavities. Various sprays and dusts were applied to the young tops in January 1929, before the flowers opened, but with no appreciable result, the mites being so protected by the closely imbricated parts of the plant that surface applications failed to reach them.

Swezey (O. H.). *Litomastix floridana* (**Ashm.**), **a recent Immigrant in Hawaii.**—*Proc. Hawaii. Ent. Soc.*, vii, no. 3, pp. 419–421, 1 fig. Honolulu, April 1931.

Litomastix floridana, Ashm., is recorded as parasitising larvae of *Phytometra* (*Plusia*) *chalcites*, Esp., in Hawaii, the parasite developing by polyembryony from eggs laid in those of the host. The host caterpillar spins its cocoon and is shortly afterwards killed by the enormous number of larvae that have developed and pupate within it, as many as 900 having been observed to emerge from one host. This Encyrtid is apparently the species that has been recorded as *L.* (*Copidosoma*) *truncatella*, Dalm., in America, which is a European species. *L. floridana* seems to have been introduced into Hawaii from the Eastern United States in 1898, but the author does not think that the present finding can be the result of that introduction. *P. chalcites* is a common garden insect and as the parasite apparently confines itself to the genus *Phytometra*, refusing in experiments the eggs of many other species of Lepidoptera, it would undoubtedly have been observed earlier. A parasitised larva of *Phytometra* probably arrived from California in some leafy vegetables and the parasite was re-introduced with it.

Illingworth (J. F.). **Notes on some Bugs associated with Pineapples in Hawaii.**—*Proc. Hawaii. Ent. Soc.*, vii, no. 3, pp. 465–467. Honolulu, April 1931.

The Capsid, *Leucopoecila albofasciata*, Reut., is commonly found in pineapple fields where weeds grow ; it breeds on purslane, nightshade, etc., and when caged with seedling pineapples oviposited in the leaf tissues in the axillary region. Another Capsid, *Pycnoderes quadrimaculatus*, Guer., which is a pest of cucurbits in the United States, was first observed in Hawaii in 1929 on purslane among old pineapple plants. The Anthocorid, *Orius* (*Triphleps*) *persequens*, White, is a valuable predator in Hawaii on Aphids, thrips, which transmit yellow spot of pineapple, and other insects. Eggs were found in purslane leaves and were also inserted in pineapple leaves when the bugs were caged with these plants.

Pemberton (C. E.). **An Egg Parasite of Thrips in Hawaii.**—*Proc. Hawaii. Ent. Soc.*, vii, no. 3, pp. 481–482, 4 refs. Honolulu, April 1931.

Further records are given of the Trichogrammatid, *Megaphragma mymaripenne*, Timb., which was described in a paper previously noticed [*R.A.E.*, A, xiii, 117]. It was observed on the leaves of various plants in association with small colonies of *Heliothrips haemorrhoidalis*, Bch., and was found to parasitise the egg of the latter, the adult emerging from a neatly-cut hole in the egg-shell. The numbers of these emergence holes and the relative unimportance of *H. haemorrhoidalis* suggest that the parasite is an important factor in control of this thrips in Hawaii.

Rotter (E.). **African Races of Honey Bees.**—*Bee Wld.*, xii, no. 6, pp. 67–68. Camberley, Surrey, June 1931.

The author indicates the distribution and characters distinguishing five named African races of honey bees (*Apis mellifica*, L.) and in some cases discusses their habits and suitability for domestication.

Pettey (F. W.) & Griffiths (E. A.). **Effective Control of Fruit Fly by Refrigeration.**—*Sci. Bull.* [*Dept. Agric. S. Afr.*], no. 99, 9 pp. [Pretoria, 1931.]

In spite of vastly improved conditions of storage of fruit in transit from South Africa, it is admitted that exposure to the present temperature at which most fruits are stored, *viz.*, 34° F. (actually $32\frac{1}{2}$ to $35\frac{1}{2}$° F.), for about three weeks does not kill all the larvae of fruit-flies in infested fruits wrapped and packed as for export. The authors have made a number of tests of the effects of cold storage temperatures, the results of which are given in tables. It has been shown that grapes can endure a storage temperature of 28° F.; pears, 29° F.; and some varieties of stone fruits, 31° F. The tests prove that all immature stages of the fruit-fly can be killed by refrigeration of these fruits, wrapped and packed for export, at approximately 32° F. for three weeks in a Government cold storage chamber or properly equipped ship's storage with a maximum range of 3° ($1\frac{1}{2}$° below or above 32° F.). It has been demonstrated that in commercial practice the required degree of temperature can be maintained and equally distributed throughout the mass of stored fruit in South African cold stores and in recently developed refrigeration equipment in boats that convey fruit thence to England.

Chiaromonte (A.). **L'unico bollworm del cotone a Tessenei: l'*Earias biplaga*, Walk.** [The only Bollworm of Cotton in Tessenei, *E. biplaga*.]—*Agric. colon.*, xxv, no. 4, pp. 165–170, 2 pls. Florence, April 1931.

Earias biplaga, Wlk., the larva, pupa and adult of which are briefly described, is the only bollworm occurring on cotton in the Tessenei zone of Eritrea [*cf.* *R.A.E.*, A, xviii, 452]. It appears to have 3–4

generations a year, the life-cycle requiring about 35 days. The injury done is not serious. As cotton is the only food-plant, the destruction of all cotton plants immediately after harvest is advised.

FRANCOLINI (B.). **Nuovi dati sulla produzione e il commercio delle banane in Somalia.** [New Data on Banana Production and Trade in Italian Somaliland.]—*Agric. colon.*, xxv, no. 4, pp. 170–176. Florence, April 1931.

There are no serious insect pests of banana in Italian Somaliland; *Aspidiotus destructor*, Sign., is almost completely controlled by spraying with oil emulsion.

ATTIA (R.). **A Study on Sodium Fluo-silicate with special Reference to its Toxicity to Farm Animals.**—*Bull. Minist. Agric. Egypt*, no. 105, 38 pp., 2 pp. refs. Cairo, 1930. Price *P.T.*4. [Recd. May 1931.]

Since 1926–27, when it first came into use as an insecticide in Egypt, sodium fluosilicate, the properties of which are discussed, has been employed against a number of pests [*cf. R.A.E.*, A, xvii, 418], including locusts, against which a sweetened bran bait containing 4 per cent. fluosilicate is used, and *Ceratitis capitata*, Wied., for which a spray of 1·87 lb. fluosilicate and 45 lb. sand sugar dissolved in 72 gals. water is now the standard measure. *Calandra oryzae*, L., was completely controlled in 2–3 weeks when 3,000 gms. wheat were mixed with 1 gm. sodium fluosilicate combined with flour as a carrier, but *Tribolium confusum*, Duv., proved to be more resistant. Sodium fluoride in all proportions up to 1 : 2,500 is more toxic to *C. oryzae* than sodium fluosilicate, giving total control in little over a week. The germination of wheat dusted with sodium fluosilicate is greatly impaired.

The bulk of this study was devoted to experiments on the toxicity of sodium fluosilicate to goats and rabbits, as compared with that of sodium arsenate or copper carbonate.

MAHEUX (G.). [**Reports of the Provincial Entomologist.**]—*Rep. Minist. Agric. Prov. Quebec, 1927–28*, pp. 183–194; *1928–29*, pp. 160–168. Quebec [1928 & 1929]. [Recd. May 1931.]

Among the many injurious insects recorded, *Phorbia* (*Pegomyia*) *brassicae*, Bch. (cabbage fly) and *Hylemyia antiqua*, Mg. (*Pegomyia ceparum*, Mg.) (onion fly) were particularly troublesome on vegetable crops during the spring of 1928 [*cf. R.A.E.*, A, xvii, 422, 425]; against the latter tests showed that five applications of Bordeaux mixture with the addition of fish-oil emulsion resulted in a great increase in the crop of onions. *Anthonomus signatus*, Say (strawberry weevil) was successfully checked by using five applications of powder with a sulphur basis to which lead arsenate was added. In the Montreal district maple groves were almost invariably infested with *Paraclemensia acerifoliella*, Fitch (maple-leaf cutter). The situation with regard to *Pyrausta nubilalis*, Hb. (European corn borer) is discussed by N. Parent and P. Lagloire. In August and September 1928 the borer had not extended beyond the area infested in 1927 but had increased within the range of its occurrence.

CRIDDLE (N.). **Grasshopper Control in Canada East of the Rocky Mountains.**—*Bull. Dept. Agric. Canada*, no. 143 (Ent. Bull. 13), 18 pp., 2 pls., 2 figs. Ottawa, March 1931.

The grasshoppers generally associated with outbreaks in Canada are *Melanoplus mexicanus*, Sauss., *M. femur-rubrum*, DeG., *M. bivittatus*, Say, and *Camnula pellucida*, Scudd. About a dozen others occur in more or less injurious numbers, all of them hatching from eggs laid in the ground in the previous year, so that a watch for ovipositing females enables a forecast of future outbreaks to be made. Migration also may have an important bearing on infestation in the following year and should be kept under observation. In the early part of the season, these migrations are of almost daily occurrence and may be away from, rather than towards, the best food supply, and may continue back and forth depending wholly on the force and direction of the wind. The measures discussed include ploughed strips as a barrier against the hoppers, early sowing of grain, ploughing to destroy the eggs, the burning of heaps of straw in which the hoppers collect at night, and the application of poison baits that have proved successful in the past. Natural enemies include Bombyliids, Sarcophagids, Tachinids, blister beetles and Carabids, *Systoechus vulgaris*, Lw., and *Sarcophaga kellyi*, Aldr., being especially valuable ; fungous and bacterial diseases also destroy many grasshoppers.

Keys are given to the first stage hoppers and adults of several grasshoppers, with individual notes on their bionomics.

KELSALL (A.), HOCKEY (J. F.) & WALKER (G. P.). **Experiments with new Spray Mixtures.**—*36th Ann. Rep. Pomol. Fruit Gr. Soc. Quebec 1929*, pp. 26–37. Quebec [1930]. [Recd. May 1931.]

This is a summary of results obtained in experimental work with sprays for apples during the past few years in Nova Scotia and New Brunswick, some account of which has already been noticed [*R.A.E.*, A, xviii, 298]. A very efficient fungicide and insecticide consists of $3\frac{1}{2}$ lb. aluminium sulphate, 1 gal. standard concentrated lime-sulphur and $\frac{3}{4}$ lb. calcium arsenate to 40 gals. water. In pre-blossom applications as much as $1\frac{1}{2}$ lb. calcium arsenate, but after blossoming not more than $\frac{3}{4}$ lb., can be used, and in the last application $\frac{1}{2}$ lb. nicotine sulphate may be added. The presence of the aluminium sulphate eliminates the typical lime-sulphur injury. Precautions should be taken to avoid inhaling the poisonous hydrogen sulphide gas liberated when aluminium sulphate and lime-sulphur are mixed, and as the mixture is somewhat corrosive to brass valves, etc., the spray outfit should be washed out every day with water and the valves be preferably made of uncorrosive material. The addition of iron sulphate to lime-sulphur also eliminates injury ; used alone or with nicotine this mixture is a poor fungicide, but with the addition of calcium arsenate it is an efficient insecticide and is of high fungicidal value, though not, perhaps, so high as the standard sprays. In 40 gals. of water, 4 lb. of iron sulphate should be used with 1 gal. concentrated lime-sulphur and 1 lb. calcium arsenate (which may be increased in pre-blossom applications).

Preliminary experiments with calcium monosulphide indicate that this is an effective and safe fungicide for use on apple trees and can be combined with either lead arsenate, calcium arsenate or nicotine

sulphate. This spray, which is considered very promising, is being studied further and is not as yet recommended to growers.

THOMAS (C. A.). **The predatory Enemies of Elateridae (Coleoptera).**—*Ent. News*, xlii, nos. 5–6, pp. 137–140, 158–167, 3 pp. refs. Philadelphia, Pa., May-June 1931.

The following is taken from the author's summary: a review of the literature from different parts of the world, on the natural control of Elaterids and their larvae, indicates that predators are of much more importance than parasites. Birds, both wild and domestic, are the chief predators, Carabid beetles probably coming second, though toads and frogs, moles and certain Dipterous larvae are also of considerable value. In spite of the apparent efficiency of these predators, however, they are never more than partly effective in controlling an outbreak of wireworms, and the aid they render should always be supplemented by artificial control measures.

STODDARD (H. L.). **The Bobwhite Quail, its Habits, Preservation and Increase.**—Super Roy. 8vo, xxix+559 pp., 69 pls., 32 figs. New York, Charles Scribner's Sons, 1931. Price £1 10*s*.

This work on the bobwhite quail (*Colinus virginianus*) in the United States includes a list of some hundreds of insects, of which 254 species are identified, from the stomachs of the adult birds. Serious losses in quail preserves are often caused at hatching time by the ant, *Solenopsis molesta*, Say, which enters the egg when the membrane is punctured by the emerging chick.

HYSLOP (J. A.). **An Estimate of the Damage by some of the more important Insect Pests in the United States.**—*E.286*, 21 pp. multigraph. [Washington, D.C.: U.S. Dept. Agric., Bur. Ent.] 1930. [Recd. May 1931.]

In an introductory note to this work, the author points out the importance of having at least a general conception of the economic status of these pests in order that the benefit derived from control measures used against them may be ascertained. Some of the factors affecting the correct estimation of the monetary losses caused as well as of those by many individual insects are discussed. The combined annual loss occasioned by 34 of the more important species is estimated at about £185,000,000.

SHEAFFER (F. E.). **Some Insect Pests and Plant Diseases of Indiana.**—*Pub. Dept. Conserv. Indiana*, no. 103, 99 pp., 48 figs. [Indianopolis, Ind.] 1930. [Recd. June 1931.]

Brief accounts are given of the bionomics and control of a large number of the insect pests of fruit and shade trees, small fruits, vegetables, and ornamental and greenhouse plants occurring in Indiana.

HUCKETT (H. C.). **Spraying and dusting Experiments with Potatoes on Long Island.**—*Bull. N.Y. Agric. Expt. Sta.*, no. 592, 38 pp., 5 figs. Geneva, N.Y., February 1931.

The results of spraying and dusting experiments on potatoes on Long Island during the years 1926–30 are discussed [*cf. R.A.E.*, A,

xviii, 375]. The most important pests of the foliage during those years were the Colorado potato beetle [*Leptinotarsa decemlineata*, Say], flea-beetles and Aphids. There were no marked differences in the results obtained from dusting or spraying ; on one variety of potato only one test in five gave a profitable increase in yield of crop, but on another such increases were obtained in seven out of twelve. Moisture conditions during mid-summer have a marked influence on the foliage and also have an important bearing on spray and dust practices, and each grower must decide to what extent these practices are profitable under existing conditions. In most seasons, pests are of sufficient importance to warrant control measures so long as the plants remain green. To control flea-beetles and *L. decemlineata*, calcium arsenate should be added to Bordeaux mixture at such a rate that 5 lb. are applied per acre. For dusting, calcium arsenate should be added to a 20 : 80 or 15 : 85 mixture of monohydrated copper sulphate and hydrated lime so as to apply 10 lb. of the arsenical per acre. Against *Leptinotarsa*, operations should begin as soon as the eggs hatch, usually about 10th–15th June, and while new shoots are rapidly growing, during June and July, applications should be made at about weekly intervals. Nicotine dust is the only reliable check to Aphid infestation, but is expensive and very uncertain in its effect on the actual yield of crop.

DRIGGERS (B. F.). **Some Studies on the larval Parasites of the Oriental Peach Moth** (*Laspeyresia molesta* **Busck**).—*Bull. New Jersey Agric. Expt. Sta.*, no. 510, 19 pp., 6 figs., 12 refs. New Brunswick, N.J., October 1930. [Recd. May 1931.]

An account is given of studies during the last six years on the larval parasites of *Cydia* (*Laspeyresia*) *molesta*, Busck, in New Jersey [*cf.* *R.A.E.*, A, xvi, 134 ; xviii, 135, 163, 406 ; xix, 43, 361]. The relative abundance of the parasites in various parts of the State at different times is recorded. *Macrocentrus delicatus*, Cress., which is a native parasite that has found a suitable host in *C. molesta*, has frequently in the past been taken for *M. ancylivora*, Rohw., but is now found to occur far more commonly and to be far more important than was realised, and was, in fact, the most important parasite at New Brunswick in 1928 and 1929. The characters differentiating these two species are described by Cushman. Attempts were made to increase the effectiveness of native parasites by rearing and liberations in the districts in which they were ineffective. Very little increase in effectiveness was gained with *Glypta rufiscutellaris*, Cress., but *M. ancylivora*, after two seasons' liberation experiments, showed a very promising increase in parasitism.

COUCH (J. N.). **The Biological Relationship between** *Septobasidium retiforme* (**B. & C.**) **Pat. and** *Aspidiotus osborni* **New. and Ckll.**— —*Quart. J. Micr. Sci.*, lxxiv, no. 3, pp. 383–437, 5 pls., 60 figs., 18 refs. London, April 1931.

The Coccid, *Aspidiotus osborni*, Newell & Ckll., lives beneath the fungus, *Septobasidium retiforme*, on oak in Carolina, sucking the plant juices. The relation between insect and fungus is a very close one, the latter entering the circulatory system of the insects and killing some of them. The Coccids can, however, live and reproduce without the

shelter of the fungus, but are then more exposed to attack by birds and insect enemies. The association is therefore of benefit to both organisms.

Report of European Corn Borer Symposium Agricultural Conference 1931.—*Stencil Bull. Purdue Univ. Agric. Expt. Sta.*, no. 5, 15 pp. multigraph. Lafayette, Ind., March 1931.

With a view to the introduction of control measures against the corn borer [*Pyrausta nubilalis*, Hb.] in Indiana, where it has been slowly spreading since its introduction in 1926, an outline is given by J. J. Davis of its history and present status in that State as an introduction to three papers dealing with various general aspects of the problem.

L. Caesar gives a brief history of *P. nubilalis* in Ontario, of the compulsory control measures introduced there in 1926 and of the results obtained in the six most heavily infested counties from 1926 to 1930. The various factors contributing to the reduction of the borer population are discussed. Although the excessively hot and dry summer of 1930 doubtless played a large part in lessening the numbers, the destruction each year of more than 95 per cent. of all the previous year's borers through proper disposal of maize remnants must have had great influence in bringing about any decrease that was effected. As infestation is actually increasing in counties where the control measures are not in force, it would appear that the strict enforcement of such measures is chiefly responsible for the reduction, but in seasons specially favourable to *P. nubilalis* the best that can be hoped for is to lessen the rapidity of its spread. The need for devising simple mechanical methods for cleaning up maize fields is indicated, and the more promising tools at present in use for this purpose are briefly described.

The various methods used for the control of *P. nubilalis* are discussed by G. A. Ficht, including low cutting of the maize while the borers are still in the stalks, insecticidal treatments in June and July when the eggs are being laid on the foliage and the young larvae are feeding externally, and late planting. Studies in Michigan have shown that the number of borers in maize is reduced on an average about 3 per cent. with each day of delay in the planting date. During the past 3 years, maize in Michigan has not received eggs until it has reached a height of about 14 inches [*cf. R.A.E.*, A, xix, 481], and the principle of late-planting is to keep the plants small and unattractive until the greater part of the eggs have been laid, or until late June and early July, though infestations in Indiana are at present not severe enough to warrant late planting.

Another factor governing infestation is the effect of the length of the growing period of maize varieties on the number of eggs capable of reaching the full-grown borer stage. Thus in 1930 about 16 per cent. of the eggs gave rise to mature borers in an early variety and only about 5 per cent. in a late variety of maize. Experiments in Michigan also indicate that the thinner the stand of maize the more eggs the individual plants receive.

Sweet maize, which is the first to be planted, is likely to receive the first severe infestations in Indiana. In studies with insecticides, the best results have hitherto been secured with liquid applications, kills as high as 92 per cent. having been obtained with combinations of oil and lead arsenate. Nicotine and penetrol have given 85 per cent.

control under the favourable conditions prevailing during the 1930 season, and some fluorine compounds also show considerable promise. In the absence of native parasites of *P. nubilalis*, foreign parasites have been liberated in Indiana since 1926. Up to the present 166,000 individuals of 12 different species have been liberated.

S. R. Miles gives an account of some of the results and conclusions arrived at in the course of variety and date of planting experiments carried out in northern Indiana during the four years 1927–30. These indicate that, for planting at the usual dates, medium and early varieties of maize are superior to late varieties where *P. nubilalis* is abundant enough to cause appreciable damage. As the corn borer becomes more abundant it may be advisable to delay the planting dates of maize, and in this event the use of medium or early varieties will be essential. Delay in planting results in poorer yields, but medium or early varieties will usually give good yields when planted as late as 15th June. Tests in which the characters of each variety of maize were studied to determine their adaptability under conditions of infestation by *P. nubilalis* showed extreme vigour to be of great importance. Some varieties affording a high yield are particularly undesirable, because the ear shanks are weak or the stalks break easily. Varieties with relatively thick or short stalks may be of value.

[**Insect Pests in New Mexico in 1929–30.**]—*41st Ann. Rep. New Mexico Agric. Expt. Sta. 1929–30*, pp. 54–66, 2 figs. State College, N.M., 1930. [Recd. 1931.]

The results of experiments in New Mexico on the control of the codling moth [*Cydia pomonella*, L.] by means of supplementary measures are discussed in detail. Among several types of bait pans tested, galvanised iron cones, 18 ins. deep and 6 ins. in diameter at the top, containing 2 U.S. qts. of molasses bait and used at the rate of 4 to each tree, gave the best results. One of these pans caught an average of 10 moths a day from 7th to 21st April. In tests against the overwintering larvae with trap bands treated with various toxic chemicals, alpha-naphthalene and beta-naphthol, both combined with lubricating oil, were the most effective, the first-named being more rapid in action and giving a mortality of over 95 per cent. in 3 months. *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.) was the only parasite reared from larvae overwintering under trap bands; the Clerid, *Cymatodera aethiops*, Wolcott, continues to be the most evident predacious enemy of *C. pomonella* in the State.

Field and laboratory investigations indicate that though adults of *Anthonomus eugenii*, Cano, are active on chillies [*Capsicum*] until frost begins, they do not survive the winter, and that hibernation is probably passed in the pupal and larval stages.

[**Insect Pests in Wisconsin, 1929–30.**]—*Bull. Wisconsin Agric. Expt. Sta.*, no. 420, pp. 5–17, 9 figs. Madison, Wis., February 1931.

White grubs [*Lachnosterna*] have been responsible for widespread losses during recent years throughout Wisconsin, particularly in the south-west where they cause damage chiefly to bluegrass pasture [*Poa*] and also to maize, small grains and various other crops. In many cases, fields or parts of fields showed no injury, and infestation

is not so high in good pastures as in bad ones. In experiments L. F. Graber found that the injury occurred more rapidly and more severely under conditions of low fertility, inadequate moisture or unfavourable environment. More larvae are required to destroy a pasture having a heavy turf than a thin one, and the better pasture will also recover from attack more rapidly.

Counts of grubs to a given area showed a decided tendency for certain leguminous plants sown among bluegrass to be less infested, the numbers in thousands per acre being 220 in bluegrass, 200 in lucerne, 160 in white clover, 40 in red clover, and only 20 in sweet clover [*Melilotus*]. In some cases it was demonstrated that the grubs had migrated for 10–12 ft. in search of food. The most important remedial measure is that of resowing the ruined pastures to sweet or red clover so that this crop will be growing during the next flight year of the beetles in 1932 (the adults last appeared in 1929 and development requires three years). No effective means of chemical control that does not damage the plants has yet been found.

Coleophora pruniella, Clem. (cherry case bearer) has recently become the most serious pest attacking cherries grown on a commercial scale in the Door Peninsula. It has long been known in America and feeds largely on wild pin cherry but has not previously been considered a pest [but *cf. R.A.E.*, A, xv, 528 ; xix, 340]. A survey in the spring of 1930 showed the necessity of immediately protecting the trees, and a dormant oil spray, which had given the best results in 1929, was recommended. It contains 8 per cent. actual oil and if it is not continuously agitated, injury to the trees will result. The spray should be directed upwards from the ground, as the larvae hibernate on the lower surface of the larger branches. Both sides of the tree should be thoroughly covered in the same operation, not less than 2 gals. of spray being applied to trees about 18–20 years of age. Counts in the fields showed that 80–98 per cent. mortality was obtained.

Various Hymenopterous parasites have been observed attacking *C. pruniella*, and there is some evidence that they may eventually assist in control. Attempts to kill the young larvae at the time they penetrate the leaf tissue by sprays of arsenicals, nicotine sulphate or pyrethrum were unsuccessful. The moths were not attracted to poison baits, but light traps were more successful, 9,000 adults being caught in one trap during a single night.

Rhagoletis pomonella, Walsh, has recently become an important pest of apples. In field experiments by C. L. Fluke and T. C. Allen, two arsenical sprays, the first applied 7–10 days after the first adults emerged and the second 10–14 days later, gave a fairly satisfactory control. In rearing cages under field conditions the flies were kept alive for about three months by being fed on a water solution of honey, yeast and crushed apple [*cf. R.A.E.*, A, xix, 342]. It was proved that some adults might oviposit within 7 days of emergence.

Williams (C. L.). **Fumigants.**—*Publ. Hlth. Rep.*, xlvi, no. 18, pp. 1013–1031. Washington, D.C., 1st May 1931.

The dangers attending the use of hydrocyanic acid gas for fumigation are discussed in general and in particular relation to the six methods usually employed for generating or liberating it. In the latter connection, it is pointed out that the residue from calcium cyanide remains dangerous after fumigation. Sections of the paper are devoted to

the advantages and disadvantages of adding a warning gas to the fumigant ; the ways in which persons are liable to be overcome by HCN during fumigation work ; methods of rescue and treatment ; and the use of gas masks. Other substances employed as fumigants are very briefly discussed on similar lines.

CLEVELAND (C. R.). **An Experiment with Summer Oil for the Control of the European Elm Scale** (*Gossyparia ulmi* **L.**).—*J. Econ. Ent.*, xxiv, no. 2, pp. 349–355. Geneva, N.Y., April 1931.

An attempt was made to control a severe infestation of elms in a nursery by *Gossyparia spuria*, Mod. (*ulmi*, auct.) discovered in Michigan in July 1930, by the use of summer oil. The emulsion, which was used at the rate of 2 per cent., was composed of approximately 65–66 per cent. actual oil, the remainder being mainly an inert emulsifier of vegetable origin and water. Significant specifications of the white oil used are viscosity (at 100° F.) 80–85 seconds ; gravity 34–34·5 ; volatility about 2 per cent. ; and sulphonation 3–4 per cent. The emulsion itself has a high degree of stability, but is relatively quick breaking upon application in diluted form ; it emulsifies readily in all types of water, and the oil persists to an unusual degree on surfaces to which it is applied. The addition of potash fish-oil soap (30 per cent.), at the rate of 4 lb. to 100 U.S. gals., probably increases the efficiency of this spray by increasing the wetting effect. Details are given of the experiment, which showed the emulsion to be highly effective in controlling the scale when the application is made at or near the maximum emergence period of the young. In 1930 this occurred between 15th and 18th July, when, however, emergence, which began about 15th June, was apparently protracted beyond the usual period. The most complete results can only be secured by extremely thorough application at a pressure of 222–275 lb. to the square inch. A high pressure type spray nozzle with disk opening of $\frac{1}{8}$–$\frac{1}{16}$ inch was used. It appears that this type of spray effects control in three distinct ways : by immediate kill of the young on the bark and leaves, by penetration under old scales and destruction of some of the hatched and unemerged young, and by a residual killing effect on the emerged young. No injury was caused to the trees under severe temperature conditions at and following application.

GAMBRELL (F. L.). **The Spruce Gall Aphid** (*Adelges abietis*) **as a Nursery Pest.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 355–361. Geneva, N.Y., April 1931.

The following is taken from the author's summaries : *Chermes* (*Adelges*) *abietis*, L. (spruce gall aphis) is an important pest of Norway spruce [*Picea excelsa*] in New York nurseries, and may also attack other species of spruce. Its life-history generally resembles that of other members of the CHERMESINAE, but differs in that no alternate host appears to be involved. There are two generations a year, both of which occur on spruce. Eggs of the apterous agamic females are deposited in masses of 100–200 at the bases of the buds about 1st May. These eggs give rise to the gallicola nymphs, which continue their development within the galls and from which the alate, non-migrans females develop. These females deposit their eggs on the needles in masses of 30–40, beginning about 1st July, from which are produced the apterous agamic females, which overwinter on the branches of the spruce.

Miscible oils and Bordeaux lubricating oil emulsions in the main have afforded very satisfactory control, but in some instances have been attended with rather serious injury to the trees. Differences have been detected in the degree of injury, both from the standpoint of materials and the dilutions used. Combinations of nicotine with Penetrol, soaps and oils, and spray mixtures consisting of either lime-sulphur or soap uncombined have shown promising results, without producing any apparent injury to the trees.

Poos (F. W.) & Smith (F. F.). **A Comparison of Oviposition and nymphal Development of** *Empoasca fabae* **(Harris) on different Host Plants.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 361–371, 2 pls., 6 refs. Geneva, N.Y., April 1931.

The following is taken from the authors' summary: During 1929 and 1930 certain forage crops and other plants were used in comparative tests to ascertain the plants that are chosen by *Empoasca fabae*, Harr., for oviposition and also the number of nymphs developing to adults. With several of these food-plants the amount of injury present seemed to be correlated in some way with the amount and type of the pubescence borne by them, rough, hairy pubescent varieties of a species being usually much less injured than non-pubescent or appressed ones [*cf. R.A.E.*, A, xviii, 381]. It was shown that more nymphs hatched on certain food-plants than on others, regardless of whether such food-plants were very hairy or only slightly pubescent. In this study 101 tests were made involving the use of 3,562 adults and the hatching of 9,108 nymphs. When varieties of red clover and soy-bean were tested, more nymphs hatched on the non-pubescent or appressed pubescent varieties than on the rough hairy ones, but more nymphs hatched on hairy Peruvian lucerne than on Kansas lucerne, a much less pubescent variety.

The data obtained do not show that the rough hairy pubescence of certain varieties is the primary reason for their greater resistance to injury by *E. fabae*, since eggs were deposited freely in all the food-plants tested even when the adult leafhoppers were confined to varieties of a single species of plant that bore different types of pubescence. Development from first-instar nymphs to adults occurred readily on the varieties of lucerne, red clover, and soy-bean used, regardless of amount and type of pubescence borne by them. The comparison of the development of *E. fabae* to adults upon different food-plants was studied in 118 tests involving the use of 3,981 individuals. It seems probable that factors other than the amount and type of pubescence are at least in part responsible for the resistance to injury by *E. fabae* observed in some of the strongly pubescent varieties.

Bottger (G. T.) & Kent (V. F.). **Seasonal-history Studies of the European Corn Borer in Michigan.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 372–379. Geneva, N.Y., April 1931.

The following is taken from the authors' summaries: Observations made on several hundred specimens for the five consecutive seasons 1926–30, both in the field and in the insectary, indicate that favourable temperatures and humidity are the most influential factors in promoting normal seasonal development of *Pyrausta nubilalis*, Hb. (European corn borer). All stages of development are either hastened with excess of heat, as in 1929 and 1930, or retarded with a prepon-

derance of low temperatures, as in 1926 and 1927. High humidity caused by heavy precipitation or an accumulation of moisture from other sources is indispensable for the development of *P. nubilalis*.

The average date for the beginning of pupation in the field in the Munroe area was 9th June; and that for the beginning of adult emergence, 22nd June. The average date for the beginning of oviposition was 25th June and that for maximum oviposition about 10th July. Practically no eggs were laid after 26th July. Normal seasonal development is dependent upon high temperatures accompanied by an abundance of moisture, and where either of these factors is rendered abnormal by natural or artificial means, seasonal development is likewise abnormal. Both pupation and emergence were delayed under conditions prevailing in the insectary and the cages. The average length of life for the female moth, when allowed to feed and mate, is about 13 days or about one day longer than the average for males. The average number of eggs laid by a moth in the insectary was 397·7, and there was an average of 23 eggs to a mass, or about 6 eggs to a mass more than the average in the field. There appears to be a tendency in *P. nubilalis* towards producing two generations a year in Michigan.

Ficht (G. A.). **Some Observations on the planting Date of Corn and its Relation to European Corn Borer Population.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 380–386, 2 refs. Geneva, N.Y., April 1931.

Studies during three seasons in Michigan on the relation between planting date of maize and infestation by *Pyrausta nubilalis*, Hb. (European corn borer) showed that in the presence of early plantings the populations of later ones are much reduced, extremely late plantings being almost entirely free. In natural field plantings, however, where factors such as soil, variety, fertility and planting rate were variable, the planting date was not always an index to borer infestation or population. The comparatively light infestations on late plantings seemed to be due almost entirely to height, no eggs being laid on such plantings until they had reached an attractive height. The average height at which all the plantings began to receive eggs, exclusive of those that were sufficiently tall to receive eggs at the start of oviposition, was 14·66 inches in 1928, 15·78 in 1929 and 13·53 in 1930. These studies confirm the findings of other workers [*R.A.E.*, A, xvii, 378; xviii, 75] that height is apparently an index to the most important factors governing oviposition, and the required growing period of the varieties an index to the factor or factors chiefly responsible for variations in the rate of larval survival. In any given season the survival rate varied according to the required period of maturity of the varieties used, the earlier varieties indicating a more favourable condition for establishment than the later ones [*cf. R.A.E.*, A, xix, 476].

Kelsheimer (E. G.) & Polivka (J. B.). **Correlation of Corn Borer Survival with Maturity of Corn.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 386–388, 2 refs. Geneva, N.Y., April 1931.

In additional experiments conducted in Ohio in 1930 to obtain further data on the relationship between survival of *Pyrausta nubilalis*, Hb., and planting date of maize [*R.A.E.*, A, xviii, 75], it was found that the number of larvae attaining the full grown stage in maize planted on 15th May was approximately four times as great as in the same variety

planted on 8th June. A comparison of larval survival and silking date for early and late planted maize shows a direct correlation in the percentage of larval survival with earliness of planting and similarly with earliness of silking. Data obtained from early, medium and late varieties of maize all planted on 8th May and receiving only natural egg deposition, showed the highest survival in the earliest maturing variety, the others following in order of their maturity. These data show that the difference in the development in a single variety planted on two different dates may be equivalent to the difference obtained in different varieties planted on the same date.

Neiswander (C. R.) & Savage (J. R.). **Migration and Dissemination of European Corn Borer Larvae** (*Pyrausta nubilalis* **Hubn.**).—*J. Econ. Ent.*, xxiv, no. 2, pp. 389–393, 3 figs. Geneva, N.Y., April 1931.

A study of the time, distance and manner of larval dispersion of *Pyrausta nubilalis*, Hb., has been made in Ohio during the past three years. In 1929 and 1930 the central hills of a number of otherwise uninfested plots of maize were infested with known numbers of eggs in order to determine the distribution of the ensuing larval population. The number of larvae recovered on the original hills and the distance of larval dispersion were quite varied for the two years, but in 1929, when the more normal conditions prevailed, about 50 per cent. of the larvae recovered from a given egg deposition had dispersed to hills other than that on which they had originated. Infestation became distributed by two methods, aerial drift of newly hatched larvae, and migration of full-grown larvae on the ground surface. In one experiment in 1929, a trap was placed round the central hill to prevent migrating larvae from infesting the surrounding hills, so that any spread of infestation must have resulted from larvae carried over the traps in air currents. No migrants were found in the traps until the larvae were full grown, but evidence of infestation was observed in the surrounding hills at practically the same time as was that of the central hill, indicating that larval feeding started simultaneously and that drift dissemination occurred soon after hatching had been observed. The fact that nearly twice as many larvae were recovered from the surrounding hills as from the traps indicated that for 1929 the effective drift dissemination was greater than the effective migration of the full-grown larvae, although the relationship undoubtedly fluctuates from year to year with variations in climatic conditions.

Trap recoveries in two distinct seasons showed that the chief period of migration in 1928 was the latter part of August, whereas in 1930 more than 70 per cent. of the migration occurred during the first two weeks in September. For both years the period of migration extended from the middle of August to the latter part of October. It was almost identical for early and late varieties of maize in spite of the difference of maturity. The amount and distance of dispersion both increased as the population at the source increased, competition for food and space being the probable regulating factor. Out of 1,300 larvae released in 1930, only 66 or 5·1 per cent. were recovered from all stalks dissected during the latter part of October, a single previous experiment in 1926 having given a 46 per cent. recovery. Although possibly partly due to unfavourable weather conditions, the 1930 results show a high degree of mortality of migrating larvae. This high

death rate together with the amount of movement that has been shown to occur serves to explain the autumn and spring decreases in field populations repeatedly noted by investigators.

Polivka (J. B.). **The Effects of physiological Change in the Corn Plant on Corn Borer Survival.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 394–395. Geneva, N.Y., April 1931.

Experiments conducted with different varieties of maize have brought out the fact that certain physiological differences in the plants produce significant differences in the response of *Pyrausta nubilalis*, Hb. Reduction in population in plants treated with insecticides is doubtless due in part to these physiological changes. It would therefore seem essential in insecticide investigations to measure the development and yield of the maize plants as well as to determine the borer population.

Experiments in 1928 with sodium fluosilicate showed that the heavier applications of this material resulted not only in a reduction in borer population, but also in a decrease in yield, which was accompanied by a delay in date of silking. A similar use of infusorial earth in 1929 was accompanied by approximately 50 per cent. reduction both in borer population and yield. The data obtained appeared to indicate that part of the reduction in borer population was due to the physiological disturbance in the plants. A further experiment in 1930, in which disturbances were inaugurated in the plants by breaking the leaves, pruning the shoots, capping the ears and spraying with 8 per cent. verdol oil, showed a considerable reduction in the yield of these plots owing to the treatment applied. Egg deposition was too slight to admit of obtaining dependable records of the survival percentage associated with the different treatments. It may therefore be concluded that the survival of *P. nubilalis* may be affected if the development of the maize is retarded by mechanical or insecticidal treatments.

Simanton (F. L.), Dicke (F. F.) & Bottger (G. T.). **The lethal Power of certain Insecticides tested in Michigan against the European Corn Borer.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 395–404. Geneva, N. Y., April 1931.

This is a progress report of tests to determine the effectiveness of insecticides against *Pyrausta nubilalis*, Hb., made over the four-year period 1927–30 in commercial fields under conditions that prevail in maize growing. The highest average larval population was 975 larvae to 100 plants in 1929, and the lowest 21 larvae to 100 plants in 1930. The weather conditions varied widely from year to year, the populations being highest during the wet years. Power sprayers and hand dusters proved satisfactory in making the applications. In the case of materials with potential efficiency as both larvicides and ovicides, the first application was made at the date of maximum oviposition and the second and third at the beginning and height of the migration of the first-instar larvae. The larvicides were applied just before and just after the maximum hatch, and again four days later to cover new growth. Dusts were applied 4 times in the intervals covered by 3 sprayings. Most of the sprays were used at the rate of 4 lb. killing agent to 100 U.S. gals. water, and the standard for dust comparisons was 20 per cent. with 80 per cent. carrier. The amounts applied per acre were 150–200 U.S. gals. of spray and 10 lb. of dust with power dusters, or 30–50 lb

with hand dusters. A given insecticide generally gave a lower kill when used as a dust than when used as a spray, but those injurious to maize caused most injury in spray form. Various stabilisers, carriers, diluents, adhesives, spreaders and activators have not greatly improved the insecticides with which they were used.

The results secured indicate that lead or calcium arsenate does not cause a high mortality unless applied in excessive quantities. Some samples of barium fluosilicate were very toxic to maize, whereas others were not, the kill being good in most cases although the maize was more or less injured. Calcium fluosilicate gave consistently satisfactory results with a minimum of injury to maize. Consistent high kills with sodium fluosilicate were always accompanied by serious injury to the treated maize. Nicotine did not prove sufficiently toxic to justify its use, and talc in the small number of tests made did not produce consistently high kills. Thirteen fluorine compounds tested as sprays under the hot dry climatic conditions of 1930 made very satisfactory kills with one application.

Baker (W. A.) & Mathes (R.). *Pyrausta nubilalis* **Hubn. Handling of single-generation Larvae to supply Parasite Data.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 404–413, 1 diag., 1 ref. Geneva, N.Y., April 1931.

Factors affecting the mortality of *Pyrausta nubilalis*, Hb., and its parasites have been studied in Michigan for three seasons. These factors are borer development at time of collection, storage conditions, length of storage period and moisture requirements. The results secured in 1929–30 showed that larvae of the single generation strain, to be obtained from the field for purposes of supplying information regarding parasites, should not be collected until they first enter hibernation, or in average seasons about 1st October. Their physiological constitution at this stage of development prepares them to withstand maximum handling and changes in environment with minimum mortality. The artificial feeding of immature stages and the mortality resulting from mechanical injury are thus eliminated.

To determine the most suitable storage environment, tests were carried out in the insectary, store-room, incubator room and out of doors. The store-room, which provided the highest mean daily humidity, proved the most desirable type of environment for the storage of single borers collected in autumn until the time when they are placed under developmental conditions in the incubator room. When optimum conditions are provided for the diapause, mortality is reduced, the mean length of time required for pupation is shortened, and trouble in handling is minimised. The period of dormancy should not be terminated for purposes of forcing before 24th April, by which date the larvae have undergone sufficient physiological change to prepare them for rapid pupation without experiencing undue mortality. Under hibernating conditions prevailing in the store-room, applications of moisture proved unnecessary, no reduction in mortality or in the time required to end the diapause after the borers were placed under developmental conditions being secured by such applications. In the incubator room one application of contact moisture a week proved adequate and necessary for single generation borers placed under developmental conditions, as shown by rapid pupation and minimum mortality.

Knowlton (G. F.). **The Wheat Strawworm,** *Harmolita grandis* **Riley, in Utah—1930.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 414–416, 2 figs., 4 refs. Geneva, N.Y., April 1931.

Harmolita grandis, Riley (wheat straw-worm) is generally distributed throughout the irrigated and dry-farm wheat sections of northern Utah [*cf. R.A.E.*, A, xiv, 650]. The infestation in this area was moderately heavy during 1930, injury from the spring generation being observed in several localities and one-third of the culms examined in autumn being infested by mature forms of the second generation. Most of the infested culms contained only one larva or pupa, but in the irrigated wheat 993 out of 13,937 culms were infested with two, 187 with three and 17 with four. In dry-farm wheat 725 out of 9,725 culms were infested with two, 161 with three and 6 with four. The larvae began pupating during early September, and by late October pupae were numerous.

Damage from *H. grandis* has been reduced by allowing the land to lie fallow every other year, burning the stubble in autumn and ploughing deeply instead of disking. Crop rotation and autumn ploughing are beneficial practices commonly carried out on irrigated farms. When wheat-stubble in dry-farm areas is allowed to remain standing over the winter and ploughed in the following spring or summer, *H. grandis* may complete the first generation in self-sown wheat and increase the second generation infestation in adjacent farms.

Herrick (G. W.) & Griswold (G. H.). **Paradichlorobenzene as a Fumigant for the immature Stages of Clothes Moths.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 420–425. Geneva, N.Y., April 1931.

In experiments extending over a period of several months, paradichlorobenzene has been used at the rate of 12–16 oz. to 100 cu. ft. against the immature stages of *Tineola bisselliella*, Humm. The gas proved toxic to the eggs, larvae and pupae when confined in a tight box, trunk or cupboard. The fumigant was thrown loose into the receptacle or scattered over garments in some cases, and in others tied up in a thin piece of muslin or placed in a tin box. More of the crystals appeared to evaporate when they were loosely scattered. The efficiency of the gas appeared to be mainly dependent on the period of exposure. In thin cheap garment bags the gas did not prove very effective, but the larvae were all killed in the heavier, vapour-proof bags.

Flint (W. P.). **Protecting stored Grain from Insects by the Use of Oils.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 425–427. Geneva, N.Y., April 1931.

Experiments in Illinois showed that almost complete protection from pests of stored grain could be obtained by dipping ears of shelled maize in certain oil emulsions at rather high dilutions [*R.A.E.*, A, xix, 268]. Apparently this protection is due to the thin film of oil formed around the kernels. A series of tests now under way tend to prove that this is the case. The film seems to prevent the newly-hatched larvae from entering the grain and apparently persists for several months if the grain is undisturbed. Slight infestation that occurred when adult insects were placed on treated maize was probably due to

rubbing of the grain by their movement being in some cases sufficient to break the film. It is possible that oils of a viscosity higher than that of those hitherto used, which did not exceed 100, might be better for this work.

HEADLEE (T. J.). **The Differential between the Effect of Radio Waves on Insects and on Plants.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 427–437, 3 graphs, 1 ref. Geneva, N.Y., April 1931.

The following is the author's abstract : Electric energy propagated in an electro-static field at the rate of from 1,000,000 to 3,000,000 cycles per second with a field strength of 4,000 volts per inch can be used to destroy certain insects enclosed in the electro-static field without damage to their food-plants. When, however, the electric energy is propagated at the rate of from 12,000,000 to 15,000,000 cycles per second with a field strength of 4,000 volts per inch, both the insects and the plants are promptly destroyed. Thus it appears that there is a differential in the effect of electro-magnetic waves on insects and their food-plants and that frequency in their rate of propagation is apparently the primary selective factor.

FELT (E. P.) & BROMLEY (S. W.). **Developing Resistance or Tolerance to Insect Attack.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 437–443, 2 refs. Geneva, N.Y., April 1931.

Various unexplained peculiarities in the relations between insects and their food-plants are briefly discussed, and attention is drawn to the association between extreme abundance of insects and reduced plant vigour. Long-lived plants, such as fruit or shade trees, are not easily replaced, and although it is frequently impossible to grow resistant varieties, it may be possible to develop resistance to insect attack. Increased resistance in wheat to attack by *Mayetiola* (*Phytophaga*) *destructor*, Say, has been secured by the addition of sodium silicate to cultural solutions. Injury resulting from attempts to grow plants out of their natural environment is illustrated by damage caused by *Stephanitis rhododendri*, Horv., and *S. pyrioides*, Scott, to rhododendrons and azaleas when grown in open, sunny spots, whereas in a normal shaded environment they are rarely troubled by these pests. Injury is also somewhat proportionate to the size and vigour of the food-plant, as shown by infestations of maize by *Pyrausta nubilalis*, Hb. Extended injuries to elms by *Galerucella luteola*, Müll. (*xanthomelaena*, Schr.) are dependent to a considerable extent upon climatic conditions that render the growth of the food-plant less vigorous. A peculiar and unexplained physiological reaction by *Porthetria dispar*, L., to individual trees of *Salix alba* is quoted from a paper previously noticed [*R.A.E.*, A, iii, 668]. Evidence available indicates that certain cambium borers, including *Agrilus anxius*, Gory, *A. bilineatus*, Weber, *Scolytus quadrispinosus*, Say, and *Phloeosinus dentatus*, Say, successfully invade trees with a lowered vitality and that in some cases it is possible to stimulate growth by a fertiliser or by watering so that the trees may even destroy the borers. It is suggested that a uniform and satisfactory supply of moisture throughout the season, and promotion of a vigorous growth may be valuable preventive measures in the case of certain insects.

Baker (W. A.) & Arbuthnot (K. D.). **An Incubator Room.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 444–449, 2 pls., 3 figs., 1 ref. Geneva, N.Y., April 1931.

The following is the authors' abstract : Details of construction of hygral and thermal equipment for installation in an incubator room are given. The selection and treatment of the room are also discussed.

Fluke, jr. (C. L.), Koch (K.) & Graber (L. F.). **Grub Infestation as a possible Indication of Crop Selection by June Beetles for Egg laying.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 450–452, 3 refs. Geneva, N.Y., April 1931.

An account is given of studies in Wisconsin in connection with the infestation of permanent bluegrass pastures [*Poa*] by *Lachnosterna* (*Phyllophaga*) spp. showing that lucerne growing in bluegrass was almost as heavily infested as bluegrass growing alone, whereas sweet clover [*Melilotus*] and red clover were apparently avoided by the ovipositing beetles [*R.A.E.*, A, xix, 478]. Data gathered on three other plots of sweet clover established in old bluegrass pastures tend to confirm the assumption that *Lachnosterna* avoids bluegrass in which thick stands of sweet clover are growing during the oviposition period.

King (J. L.). **The present Status of the established Parasites of** *Popillia japonica* **Newman.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 453–462, 4 diag., 1 ref. Geneva, N.Y., April 1931.

A brief comparative outline is given of the seasonal cycle of *Popillia japonica*, Newm., as it occurs in New Jersey and in Japan, where three markedly different conditions are found in the course of progress northward from Yokohama to Sapporo. In the most southerly latitude a one-year life-cycle is prevalent ; in the central region, where conditions closely correspond with those of New Jersey, 25–30 per cent. of the beetles undergo a two-year cycle, and in the most northerly region 75 per cent. require two years for development. Under present conditions in New Jersey and Pennsylvania *P. japonica* has a one-year cycle ; only a very few larvae under exceptional conditions in low areas and moist soil require two seasons to complete their development. As the beetle spreads northwards in the United States, however, it will undoubtedly develop on lines similar to those described in Japan.

Notes are given on each of the five parasites of *P. japonica* established in the United States, of the which the three Diptera are true parasites of the beetle in Japan, whereas *Tiphia vernalis*, Roh., four colonies of which have given recovery records, with considerable increase in one case, and *T. popilliavora*, Roh., are parasites of allied species of *Popillia* in Korea [*R.A.E.*, A, xv, 297, 443 ; xvii, 176 ; xviii, 411 ; xix, 200] ; and the various reactions of the parasites to the different phases of *P. japonica* in their countries of origin and in New Jersey and Pennsylvania are discussed and compared. With all the Diptera there seem to be obstacles in the new environment which limit their increase. In the case of *Centeter cinerea*, Ald., there seems to be a direct response to climatic conditions that throws it out of alignment with its host. The author considers that a more northern climate is necessary to bring about a proper delay in its emergence so that it will appear with its host, and that only under these conditions can it be of any economic value in the control of *P. japonica*. In *Prosena siberita*, F., the

difficulty seems to be with the host, the climatic conditions being such that it has responded with practically a one-year cycle which is unfavourable to the parasite. This parasite would be likely to be of value in the biological control of *P. japonica* in a region where a two-year cycle occurred, thus supplying host material at times and in quantities suitable to the parasite. *Dexia ventralis*, Ald., has succeeded in producing two generations a year, apparently without alternate hosts and under adverse conditions. It is likely to be of considerable economic value in controlling *P. japonica* where this host provides an abundant supply of belated two-year larvae in the soil. Native Scarabaeids, if present in sufficient abundance, might also serve as alternative hosts.

The only solution for this lack of adjustment between host and parasite seems to depend on the use of these parasites in the future when the host has extended its range into zones climatically different from the present centre of parasite introduction.

Leonard (M. D.) & Mills (A. S.). **A preliminary Report on the Lima Bean Pod-borer and other Legume Pod-borers in Porto Rico.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 466–473. Geneva, N.Y., April 1931.

Notes are given on the distribution, life-history, economic importance, food-plants and control of *Maruca testulalis*, Geyer (lima bean pod borer) [*R.A.E.*, A, iii, 248; xviii, 507; xix, 451]. No life-history observations have been completed in Porto Rico, except to determine the pupal period as lasting 6–8 days. Most of the pupae from which adults were reared occurred on the lids of tin boxes in which infested pods were placed, a few were found in the pods themselves, but none in sand placed in the boxes. Small larvae have been found within the blossoms and slightly larger ones in the pods. *Microbracon thurberifagae*, Mues., has been recorded as the most important parasite of the larvae in Cuba, where they are also occasionally attacked by *Apanteles* sp., and somewhat more commonly by *Argyrophylax albincisa*, Wied.

During a search for the food-plants of *M. testulalis*, which in Porto Rico was found only in string beans and lima beans, although it had formerly been recorded there once on sword beans [*Canavalia ensiformis*] and once on pigeon peas [*Cajanus indicus*], the Pyralids, *Etiella zinckenella*, Treit., and *Fundella cistipennis*, Dyar, and the Tineid, *Brachyacma palpigera*, Wlsm., were reared from the pods of certain pulses. Preliminary notes are given on the distribution, food-plants, life-history and parasites of each of these species. *E. zinckenella* was found on lima beans, pigeon peas, *Crotalaria* and cowpeas in Porto Rico, the pupal stage lasting 9–14 days. Mature larvae placed on earth or sand at once burrowed beneath the surface and formed tough silken cocoons. Of three parasites reared, one is believed to be *Heterospilus etiellae*, Roh., and the two others were a male and female of the genus *Eurytoma*. *F. cistipennis* has been reared in Porto Rico from cowpeas, *Cassia occidentalis*, lima beans, sword beans and pigeon peas. The life-history in St. Vincent has already been noticed [vi, 120]. The pupal period was found to be 8–12 days in Porto Rico. *B. palpigera* was reared in Porto Rico from dry pods of pigeon peas, the pupal period lasting 9–11 days and the pupae occurring at one end of the pod in a tough silken cocoon. Many mature larvae

were found to be attacked by an undescribed species of *Paralitomastix*, parasitism amounting to over 50 per cent. in some cases. An average of 71 parasites emerged from one host larva, but as many as 25 per cent. of the total number of parasites present may fail to emerge. Since seed for the next crop is obtained from dried pods left on the plants, *B. palpigera* is sometimes responsible for a considerable reduction in the seed crop of pigeon peas, which are an important source of food in Porto Rico.

Lepidopterous pod-borers of minor importance found in Porto Rico were *Heliothis virescens*, F., and *Ancylostoma stercorea*, Zell., on pigeon peas, *H. obsoleta*, F., and *Laphygma frugiperda*, S. & A., on string beans, and *Utetheisa ornatrix*, L., on *Crotalaria*.

DeLong (D. M.). **Distribution of the Potato Leafhopper** (*Empoasca fabae* **Harris**) **and its close Relatives of** *Empoasca*.—*J. Econ. Ent.*, xxiv, no. 2, pp. 475–479, 2 figs., 1 ref. Geneva, N.Y., April 1931.

From field observations and examination of genitalia it has been found that, in addition to *Empoasca fabae*, Harr., which has been regarded as the only important species of its genus infesting vegetable crops in the United States, at least three and probably four other species are involved, though all records of *E. flavescens*, F., from America appear to be erroneous. The species concerned are *E. filamenta*, DeLong, *E. abrupta*, DeLong, *E. arida*, DeLong, and probably *E. cerea*, DeLong. A study of the crops they infest and the conditions under which they occur indicates that they cause economic damage and are distributed for the most part in distinct areas. *E. fabae* shows a preference for low altitudes and humidity and occurs in the eastern United States, whereas *E. filamenta* occurs at high altitudes in arid regions and its area of importance is the intramontane region of the western United States. *E. abrupta* and *E. arida* occur at low altitudes in arid regions and are found on the Pacific Coast in abundance. *E. filamenta* particularly attacks potatoes, beans and sugar-beet, but has been collected in California, where it is not of importance, on a variety of vegetables and on lucerne. Although both *E. abrupta* and *E. arida* occur in injurious numbers, *E. abrupta* is more widespread. It is apparently most numerous on cucurbits, though lucerne, maize, cotton and sunflowers are also attacked. The largest populations of *E. arida* are found on potato and sugar-beet. *E. cerea* has been collected in northern and central Utah and has been taken in small numbers in California on sugar-beet, lettuce, green beans, okra [*Hibiscus esculentus*] and carrots, but is apparently not of importance. *E. fabae*, the food-plants of which include apples and cotton, causes hopperburn on potatoes, egg-plant, rhubarb and dahlias, stunting or dwarfing on beans, yellowing on lucerne and reddening on clover. Injury of this type is not caused by the three western species, though some form of white spotting or white stippling is observed where they are abundant.

It is apparent from data collected during the past 5 years that wild food-plant records in connection with the occurrence of *E. fabae* on vegetable crops in early spring have been concerned chiefly with *E. erigeron*, DeLong, which occurs on *Erigeron annuus*, *E. canadensis* and other wild food-plants and overwinters in the egg stage, becoming active in the field about the same time as *E. fabae*, and *E. bifurcata*, DeLong, which attacks tansy and related plants.

Alden (C. H.) & Farlinger (D. F.). **The artificial Rearing and Colonization of** *Trichogramma minutum*.—*J. Econ. Ent.*, xxiv, no. 2, pp. 480–483, 2 pls. Geneva, N.Y., April 1931.

The results are given of two years' experiments in rearing *Trichogramma minutum*, Riley, and colonising it on *Cydia* (*Laspeyresia*) *molesta*, Busck (oriental fruit moth), *C.* (*Carpocapsa*) *pomonella*, L. (codling moth), and *Acrobasis* spp. (pecan case-bearers) in Georgia. The equipment and methods described are very similar to those already noticed [*R.A.E.*, A, xviii, 393; xix, 95–97]. The laboratory host used was *Sitotroga cerealella*, Ol. A severe infestation of a Gamasid mite was controlled in the breeding rooms in 1929 by applications of superfine dusting sulphur. This had no apparent effect on *S. cerealella*, but *T. minutum* practically refused to oviposit in its eggs in the treated grain. Moth production was also retarded in August 1929 by an outbreak of *Habrocytus cerealellae*, Ashm., a larval parasite of *Sitotroga*. In 1930 *Calandra oryzae*, L., and *Tribolium castaneum*, Hbst. (*ferrugineum*, F.) increased rapidly and destroyed great quantities of grain, the latter also feeding on the eggs of *S. cerealella* and the dead bodies of the adults. The reduced moth supply was practically destroyed by the middle of September by *H. cerealellae*, which appeared in August.

Colonisations were made in 1930 in practically all the peach, apple and pecan sections of the State. Experiments conducted in the mountainous section of north-east Georgia proved it to be useless to colonise *T. minutum* prior to 1st June, as the nights were too cool during May for it to establish itself satisfactorily, even though eggs of *C. molesta* were present. In central and southern Georgia, colonisations can be made several weeks earlier. Parasitised eggs of *C. molesta* were recovered on 7th July where parasites had been liberated in an orchard on 3rd July, the percentage of parasitism being 54·8. Parasitised eggs were recovered 80 ft. from the point of liberation, and the adults were observed on peach foliage at various times throughout the summer. The average percentage of parasitised eggs from collections made on three broods of the moth was 47·2 per cent. Parasitism of the eggs of *Acrobasis* spp. in pecan groves was also obtained, but the percentage of parasitism was low. In the case of *C. pomonella* 70·4 per cent. of the third brood eggs were parasitised in 1930, from a colonisation made in the autumn of 1929 about $\frac{3}{4}$ mile distant, thus indicating a winter survival of the parasite.

Gould (G. E.). *Pangaeus uhleri*, **a Pest of Spinach.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 484–486. Geneva, N.Y., April 1931.

Pangaeus uhleri, Sign., is recorded as attacking spinach seedlings that were just pushing through the ground in Virginia in September 1930. Although the infestation was confined to a few fields, the seriousness of the injury caused shows that this Cydnid, which has not been reported previously as causing damage to cultivated crops, is sometimes of economic importance. The method of attack consisted of inserting the rostrum into the stem close to the seed-coat and sucking the sap, so that the plant was unable to push its way through the ground. Plants that were strong enough to push through to the surface were seldom attacked. The habits of *P. uhleri* are described in some detail. The bugs avoid bright sunlight and show a preference for

hiding in cracked earth caused by the germination of seed. From 4 to 20 were observed to cluster round the seed, slowly roll away the seed-coat and finally bury it. The bugs first appeared in July, apparently migrating from neighbouring woods. An examination of several fields in September showed that in two of them adjacent to the woods not more than 15 per cent. of the plants had withstood the attack. There is possibly some correlation between the appearance of these bugs and the exceedingly dry season of 1930. The adult and nymph are briefly described. Other Cydnids recorded as injurious in the literature are *P. bilineatus*, Say, which attacks strawberries in Florida and Bermuda, and *Thyreocoris pulicarius*, Germ., which has been responsible for much damage to celery in Michigan and Ohio and is noted for causing a foul taste in raspberries and blackberries over which it crawls.

An experiment in treating the seed with various materials either poisonous or repellent to the insects was started, but owing to the exceedingly dry condition of the soil, the seed did not germinate until long after all the bugs had disappeared.

HASEMAN (L.). **Observations on the Wintering Habits of the Striped Cucumber Beetle.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 486–490, 1 ref. Geneva, N.Y., April 1931.

The following is the author's abstract : Observations are reported which indicate that under conditions prevailing in Missouri the adults of *Diabrotica melanocephala*, F. (*vittata*, F.) (striped cucumber beetle) feed on green cucurbit fruits and the blossoms of weeds and flowers long after the first killing frosts destroy the natural food crops. In cage experiments the beetles collect beneath green as well as dry grass and other vegetation supplied as coverage, but they do not burrow into the ground.

Section of Plant Quarantine and Inspection.—*J. Econ. Ent.*, xxiv, no. 2, pp. 497–557. Geneva, N.Y., April 1931.

This series of papers includes : Review of the Work of the Plant Quarantine and Control Administration for the past Year [*cf. R.A.E.*, A, xix, 217], by L. A. Strong (pp. 499–505) ; The European Corn Borer Situation in the United States at the Close of 1930, by L. H. Worthley and E. G. Brewer (pp. 507–512) ; A Review of the European Corn Borer Outbreak in Ontario, by L. Caesar and L. S. McLaine (pp. 512–517), which deals with the rapid spread of *Pyrausta nubilalis*, Hb., in Ontario from its first appearance there in 1920 till 1926, by which year all maize within an area of 1,200 sq. miles was devastated, and the considerable success that has attended its subsequent compulsory control ; The Eradication of isolated Gipsy Moth Outbreaks, by A. F. Burgess (pp. 518–525), which reviews the methods of dealing with isolated colonies of *Porthetria dispar*, L., with information concerning a number of cases in which eradication has been accomplished ; Recent Developments in Spray Residue Removal, by D. F. Fisher (pp. 526–531) ; Plant Quarantine and Control in Cuba, by E. S. Estrada (pp. 531–535), in which an outline is given of the work of plant quarantine and insect control organised in 1915 largely as a consequence of finding *Aleurocanthus woglumi*, Ashby, attacking *Citrus* in the eastern part of the Island, and of the initiation of in-

vestigations for the introduction of parasites of this Aleurodid ; Maggot Inspection of Apples for Export to Great Britain, by A. W. Gilbert (pp. 536–538), which gives brief notes on measures, including surveys, inspection and certification, introduced as a consequence of an order prohibiting the importation of apples from the United States into England and Wales between 7th July and 15th November, unless the fruit were accompanied by a Federal certificate of inspection, stating that it was free from infestation by the apple maggot [*Rhagoletis pomonella*, Walsh] ; Legal and practical Aspects of the Relationships between the Federal and State Quarantine Offices and between National and Regional Plant Boards, by T. J. Headlee (pp. 538–544) ; Summary of Activities of the National Plant Board during 1930, by R. W. Leiby (pp. 549–550) ; Informal Report on the Principles of Plant Quarantines, by W. C. O'Kane (pp. 550–552); and Reports of the Eastern Plant Board, the Central Plant Board and the Western Plant Quarantine Board, by T. J. Headlee, E. L. Chambers and W. C. Jacobsen respectively (pp. 552–557).

Bigger (J. H.). **Another Parasite of the Sunflower Weevil,** *Desmoris fulvus* **(Lec.).**—*J. Econ. Ent.*, xxiv, no. 2, p. 558. Geneva, N.Y., April 1931.

In the course of continued studies of *Desmoris fulvus*, Lec. (sunflower weevil) in Illinois [*cf. R.A.E.*, A, xviii, 414], considerable numbers of *Microbracon mellitor*, Say, were found in 11 out of 28 lots of seed examined during the winter of 1929–30, as well as one individual of *Zatropis incertus*, Ashm., and one of *Eurytoma* sp. *M. mellitor* appeared to have its life-cycle adjusted to its host, so that the most heavily infested lots of seed also showed the heaviest parasitism, and is likely to prove important. Parasitism was also found to be most abundant in areas where sunflowers had been grown for a number of years.

Snapp (O. I.) & Thomson (J. R.). **Burying Peach Drops to prevent the Escape of Plum Curculio Adults.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 559–560. Geneva, N.Y., April 1931.

An experiment in which infested peaches were buried at various depths in the soil and the emergence of adults of the plum curculio [*Conotrachelus nenuphar*, Hbst.] was recorded indicates that dropped fruit must be buried deeper than 18 inches to prevent the escape of the adult weevils.

Davis (A. C.). *Diabrotica balteata* **Lec.**—*J. Econ. Ent.*, xxiv, no. 2, p. 560. Geneva, N.Y., April 1931.

Records of the occurrence of *Diabrotica balteata*, Lec., from 1924 to 1930 indicate that it is working its way northward along the coast of California at the rate of about 25 miles a year. There are at present no data to show how rapidly it is spreading inland, but it will probably eventually reach all the inland valleys. Commercial damage has so far been reported only from San Marcos, where *D. balteata* was found feeding on mulberry together with *D. trivittata*, Mann., and *D. soror*, Lec.

McConnell (H. S.). **A Leafhopper injuring Peach.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 560–561. Geneva, N.Y., April 1931.

Injury in peach orchards, which was considerable in 1928, increased in 1929 and became severe in a few isolated cases in 1930, was caused in Maryland by *Erythroneura plena*, Beamer, a leafhopper recently described from material collected in Kansas and Illinois without record of its food-plants. The injured peach foliage shows a white stippling on the upper surface which is caused by the feeding of both nymphs and adults on the under surface. Continued feeding causes the stippling to coalesce, giving the leaves a pale appearance. Most of the feeding takes place on the lower and inner parts of the tree, and a preference is shown for the oldest leaves. Young shoots that grow out from the trunks show a very decided gradation of injury from the base to the tip. Two full generations were observed in 1930, the adults of the first being found from 15th June to 20th July and second generation eggs from 1st July to 4th August. The eggs are placed in the smaller veins of the leaves. Second generation adults began to appear about 15th August, and were present when the leaves began to fall in autumn, suggesting that hibernation occurs in the adult stage. Second brood eggs were found to be heavily parasitised by *Anagrus epos*, Gir., the average parasitism in several collections of infested leaves being about 60 per cent. The parasites emerge from either surface of the leaves.

Collins (C. W.) & Potts (S. F.). **Attractants for the Male Gipsy Moth.**—*J. Econ. Ent.*, xxiv, no. 2, pp. 561–562. Geneva, N.Y., April 1931.

It has been found that unmated females of *Porthetria dispar*, L., give off a scent that is attractive to the males. The attractant, which is of a complex fatty nature, can be extracted, as it is soluble in ether, benzene, petrol, etc., and is active for several weeks when exposed owing to continuous generation by hydrolysis, the period of activity being equivalent to the flight season of the males. The attractant is fairly stable in cold storage, and from two-fifths to three-fifths of its value is retained at the end of one year.

Material for traps is obtained by clipping the last one or two abdominal segments of 15–30 female moths into ½–1 oz. of solvent. The solvent containing the segments is then poured over cotton contained in a 3 oz. tin fastened to a tree trunk with a nail, the tin being inverted to prevent the entrance of rain. About 1 sq. ft. of adhesive is applied to the tree trunk around the trap to catch the males attracted.

Some new and important infestations in border-infested territory and in New Jersey were discovered by the use of such traps. The use of an extract instead of living females in the traps has the advantage that it can be preserved for one or more years, that it is not necessary to visit the traps except to put them in place and remove them at the end of the season, and that the danger of starting new infestations is eliminated.

Friend (R. B.). **The Squash Vine Borer,** *Melittia satyriniformis* **Hübner.**—*Bull. Connecticut Agric. Expt. Sta.*, no. 328, pp. 587–608, 3 figs., 2 pp. refs. New Haven, Conn., May 1931.

An account is given of the distribution, bionomics and control of *Melittia satyriniformis*, Hb. (squash vine borer) [*cf. R.A.E.*, A, xii,

244], which is an important pest of cucurbits in the United States, much of the information being taken from the literature. As a result of experiments carried out during the last four years in Connecticut, the following insecticides are recommended for its control: 3 lb. lead arsenate and 1 U.S. qt. fish-oil, or 8 lb. lead arsenate coated with lead oleate, to 100 U.S. gals. water; and nicotine sulphate (1 : 100) with 0·5 per cent. soap. The basal four feet of the stems of winter squash should be thoroughly sprayed four times at weekly intervals beginning about 5th July. Lead arsenate and fish-oil is the least expensive of the sprays, though the increase in yield obtained by spraying will more than offset the cost of any one of them.

Back (E. A.) & Cotton (R. T.). **Stored-grain Pests.**—*Fmrs'. Bull. U.S. Dept. Agric.*, no. 1260 revd., 46 pp., 69 figs. Washington, D.C., March 1931.

This revision of a previous bulletin [*R.A.E.*, A, x, 594] includes notes on several additional pests of stored grain and somewhat more information on methods of fumigation.

Noble (W. B.). **Two wild Grasses as Hosts of the Hessian Fly,** *Phytophaga destructor.*—*J. Agric. Res.*, xlii, no. 9, pp. 589–592, 4 refs. Washington, D.C., 1st May 1931.

Records of infestation of grasses by Cecidomyiids identified as *Mayetiola* (*Phytophaga*) *destructor*, Say (Hessian fly) are reviewed from the literature. As these identifications were based on taxonomic criteria, they were not considered entirely definite, and biological experiments were therefore carried out to confirm them. In 1927 the progeny of flies reared from self-sown wheat in Indiana were successfully bred on *Agropyron repens* and *Elymus canadensis*, and when the resulting adults were returned to wheat their eggs developed normally. In 1929 the progeny of adults taken from the same species of grasses were reared on wheat and the resulting adults when returned to the original food-plant readily oviposited, and some of the larvae established themselves. In both experiments individuals of each generation preserved for determination were identified as *M. destructor*.

These studies indicate that the true Hessian fly is able to complete its development on *A. repens* and *E. canadensis*, although not so readily as on wheat, and that under favourable conditions it may be able to live on them in the absence of wheat.

Smith (H. S.) & Armitage (H. M.). **The biological Control of Mealybugs attacking Citrus.**—*Bull. California Agric. Expt. Sta.*, no. 509, 74 pp., 21 figs., 15 refs. Berkeley, Cal., March 1931.

The bulk of this work is devoted to an account of the methods of mass-breeding and liberation of the Coccinellid, *Cryptolaemus montrouzieri*, Muls., for the control of mealybugs attacking *Citrus* in California, including extensive notes on laboratory technique, buildings and equipment. The mealybugs concerned are *Pseudococcus gahani*, Green, *P. citri*, Risso, *P. maritimus*, Ehrh., *P. kraunhiae*, Kuwana, *P. adonidum*, L. (*longispinus*, Targ.), and *Phenacoccus gossypii*, Towns. & Ckll. The bionomics and natural enemies of each individual

species is discussed in detail, and briefer notes are given on the value of bands of burlap or corrugated paper, under which both the mealybugs and *Cryptolaemus* shelter, in facilitating the work of the latter, and of the effect on the progress of biological control of the activities of ants and such measures as spraying or fumigation.

SIMMONS (P.), REED (W. D.) & McGREGOR (E. A.). **Fig Insects in California.**—*Circ. U.S. Dept. Agric.*, no. 157, 71 pp., 38 figs., 40 refs. Washington, D.C., April 1931.

The conditions of fig-growing in California are briefly discussed and a detailed account is given of the bionomics of the insects attacking the fruit, with notes on the control of some of them. Those occurring in the orchard include *Carpophilus hemipterus*, L., and other Nitidulids, *Drosophila* spp. (particularly *D. melanogaster*, Mg.), *Frankliniella tritici*, Fitch, and a mite here described by McGregor as *Eriophyes fici*, under which name it has already been recorded in the literature [*cf.* *R.A.E.*, A, x, 471 ; xvi, 442], all of which attack the inside of the fruit ; and *Blapstinus fuliginosus*, Casey, various thrips, the Coccid, *Lepidosaphes ficus*, Sign., and *Tetranychus pacificus*, McGregor, which attack the outside, the two last-named also injuring the tree. The relation of these insects and of *Blastophaga psenes*, L., to diseases of figs is discussed [xvi, 319 ; xvii, 358, etc.]. *Plodia interpunctella*, Hb., *Ephestia cautella*, Wlk., *C. hemipterus* and *Silvanus* (*Oryzaephilus*) *surinamensis*, L., infest the dried or partly dried harvested fruit. The fumigation and storage of the dried fruit is dealt with at some length, the use of ethylene oxide being particularly recommended [xvii, 87].

RANKIN (W. H.). **Virus Diseases of Black Raspberries.**—*Tech. Bull. New York St. Agric. Expt. Sta.*, no. 175, 24 pp., 10 refs. Geneva, N.Y., March 1931.

The synonymy of virus diseases of black varieties of raspberries and their symptoms are discussed. The author recognises five virus diseases of black raspberries, namely leaf-curl beta type, severe streak, mild streak, red (raspberry) mosaic and yellow mosaic. The results of inoculations, using the two known Aphid vectors confirm previous work [*R.A.E.*, A, xv, 667], the principal conclusions being that virus-free red raspberries apparently do not carry any virus that is transferable to black raspberries ; that red mosaic is transferred from red to black raspberries by *Amphorophora rubi*, Kalt. ; that red mosaic and yellow mosaic are transferred from black to black raspberries by *A. rubi*, but are not transferable by *Aphis rubicola*, Oestl. (*rubiphila*, Patch) ; and that mild mosaic of the small yellow dot type (which may not be a virus disease) and mild streak are not transferable from black to black raspberries by *Amphorophora rubi*.

GAHAN (A. B.). **On certain Hymenopterous Parasites of stored-grain Insects.**—*J. Wash. Acad. Sci.*, xxi, no. 10, pp. 213–221, 9 figs., 1 ref. Baltimore, Md., 19th May 1931.

This paper, dealing with various Bethylids, includes a key to the species of *Plastanoxus* and a description of the female of *Cephalonomia waterstoni*, sp. n., which is probably parasitic on one or more of the

beetles infesting stored grain. It appears to be established in Australia and North America and probably occurs elsewhere. *C. westwoodi*, Kieffer, is referred to the genus *Plastanoxus*, of which it is the only species known to be a parasite of pests of stored grain.

Scrivener (J. W.). **Notes on** *Gypona octolineata* **(Say).**—*J. Wash. Acad. Sci.*, xxi, no. 10, pp. 222–223, 1 fig. Baltimore, Md., 19th May 1931.

In laboratory studies in Virginia, the entire nymphal development of the leafhopper, *Gypona octolineata*, Say, on seedling apple trees covered 38 days at a temperature of 75–85° F. The durations of the 5 nymphal instars were 1, 4, 5, 10 and 18 days respectively.

Blackman (M. W.). **A revisional Study of the Genus** *Pseudopityophthorus* **Sw. in North America.**—*J. Wash. Acad. Sci.*, xxi, no. 10, pp. 223–236, 15 figs., 20 refs. Baltimore, Md., 19th May 1931.

This revision of the North American Scolytids of the genus *Pseudopityophthorus* gives the food-plants and detailed distribution of the various species, with a key and descriptions of 7 new ones.

Parker (H. L.). **Notes on** *Meteorus* (*Zemiotes*) *nigricollis* **Thomson, an occasional Parasite of the European Corn Borer.**—*Proc. Ent. Soc. Wash.*, xxxiii, no. 5, pp. 93–103, 14 figs., 7 refs. Washington, D.C., May 1931.

The Braconid, *Meteorus nigricollis*, Thoms., the immature stages of which are described, is very occasionally a parasite of *Pyrausta nubilalis*, Hb. (European corn borer) in mugwort (*Artemisia vulgaris*) in France. It is, however, of no importance as a controlling factor; from about two million corn borer larvae, only 28 individuals of *Meteorus* were obtained. The bionomics of the parasite in the laboratory are discussed. At 68° F., the average time for development was 45 days, 21 days being passed in the cocoon. Although there is some reluctance to oviposit in larvae of *P. nubilalis*, development is easily completed in this host. It is not known whether *M. nigricollis* has other hosts in the field, where cocoons have been found from November to late March.

Aldrich (J. M.). **Notes on Diptera No. 5.**—*Proc. Ent. Soc. Wash.*, xxxiii, no. 5, pp. 116–121. Washington, D.C., May 1931.

The correct name for the Ortalid, which has been recorded as a pest of sugar-beets in Utah under the name of *Tetanops aldrichi*, Hendel [*R.A.E.*, A, xi, 78], is stated to be *Eurycephalomyia myopaeformis*, Roeder, the former name being a synonym of it.

Gahan (A. B.). **A new Species of** *Encarsia* **from Cuba (Hymenoptera: Aphelininae).**—*Proc. Ent. Soc. Wash.*, xxxiii, no. 5, pp. 121–122. Washington, D.C., May 1931.

Encarsia cubensis, sp. n., is described from females reared from *Aleurothrixus howardi*, Quaint., in Cuba.

González Ríos (P.) & Mayoral Reinat (A.). **El Cultivo del Aguacate en Puerto Rico.** [Avocado Cultivation in Porto Rico.]—*Circ. Estac. expt. insul. Río Piedras*, no. 93, 34 pp., 9 figs., 1 map, 19 refs. S. Juan, P.R., 1931.

Pests of avocado in Porto Rico include the weevil, *Diaprepes abbreviatus*, L. (*spengleri*, L.), which attacks the leaves and is only repelled by arsenical sprays, but may be attracted by a trap crop of castor-oil plants [*Ricinus communis*] ; *Lachnosterna* (*Phyllophaga*) sp., the adults of which also feed on the leaves, while the larvae injure the roots of newly transplanted plants ; and the Coccids, *Saissetia coffeae*, Wlk. (*hemisphaerica*, Targ.) and *Aspidiotus destructor*, Sign., which infest the stems and leaves, respectively, and may be controlled by oil emulsions.

Graham (A. R.). **The present Status of the Larch Sawfly** (*Lygaeonematus erichsonii* **Hartig) in Canada, with special Reference to its specific Parasite,** *Mesoleius tenthredinis* **Morley.**—*Canad. Ent.*, lxiii, no. 5, pp. 99–102, 2 refs. Orillia, Ont., May 1931.

Further investigations during 1928–29, on the activities of *Mesoleius tenthredinis*, Morl., an introduced parasite of *Lygaeonematus erichsoni*, Htg. (larch sawfly), show that in addition to Manitoba [*cf. R.A.E.*, A, xvi, 450], the parasite has become established in Quebec and in two localities in Ontario ; 100 cocoons collected in one locality in the former Province showed a parasitism of 30 per cent. In 1930 injury by the sawfly in eastern Canada was restricted to Ontario. During that year successful parasitism of the larvae was secured under laboratory conditions, a total of 536 individuals of the second, third and fourth instars being parasitised by 8 mated females of *M. tenthredinis*. Although particular care was taken not to handle the larvae directly, all transfers being accomplished by removing the larch needle upon which the larva was feeding, 80 per cent. died before spinning cocoons for the winter.

Wille (J.). **Informe del Entomólogo Jefe de la Sección de Entomología.** [Report of the Chief of the Entomological Section, Agricultural Experiment Station of the National Agrarian Society of Peru.] —*Mem. Estac. expt. agríc. Soc. nac. agrar.*, no. 2, pp. 63–72, 6 figs. Lima, January 1930. [Recd. May 1931.]

The pests of potatoes and coca [*Erythroxylon coca*] recorded in this report for 1929 have already been noticed [*R.A.E.*, A, xviii, 322 ; xix, 458]. Cotton pests include *Dysdercus ruficollis*, L. [see next paper] and *Pinnaspis* (*Hemichionaspis*) *minor*, Mask., which causes enormous losses along the coast of Peru. A 10 per cent. oil emulsion is effective against this Coccid, but its cost restricts its use to new foci of infestation. A study is being made of *Aphis maidis*, Fitch, the vector of sugar-cane mosaic. Against *Anastrepha fraterculus*, Wied., the principal fruit pest in Peru, excellent results have been achieved with pans containing a solution of sodium arsenite and cane molasses. *Lepidosaphes beckii*, Newm., and *Chrysomphalus* (*Aspidiotus*) *aurantii*, Mask., are the chief Coccids attacking *Citrus*. *Eriosoma* (*Schizoneura*) *lanigerum*, Hausm., is common on apples and quinces. An initially intense infestation of maize by *Heliothis* (*Chloridea*) was checked by a fungus and by Tachinid and Ichneumonid parasites.

Pope (J. B.). **El " Arrebiatado " del Algodón en Piura** (*Dysdercus ruficollis* **L.**). [The Cotton Stainer in Piura.]—*Bol. Estac. expt. agríc. Soc. nac. agrar.*, no. 3, 14 pp., 6 figs., 4 refs. Lima, 1929. Also in *Mem. Estac. expt. agríc. Soc. nac. agrar.*, no. 2, pp. 73–81, 2 pls., 4 refs. Lima, 1930. [Recd. May 1931.]

An account is given of observations in the Piura valley on *Dysdercus ruficollis*, L., which is of varying importance in different districts of Peru [*R.A.E.*, A, xviii, 359]. A female lays 60–80 eggs during an average period of 13 days. The egg and nymphal stages average 8 and 45 days, and adult life 30. Females fed on bolls 40 days old produced almost four times as many eggs as those fed on bolls 20 days old, and adults placed with plants that had only begun to flower died without reproducing. For control, all cotton plants should be destroyed as soon as possible after the harvest and the new crop sown at dates specified for the different localities.

Ogloblin (A.). **Informe preliminar sobre un nuevo parásito del trigo.** [Preliminary Report on a new Pest of Wheat.]—*Bol. Minist. Agric. Nac.*, xxix, no. 4, pp. 451–455, 9 figs. Buenos Aires, 1930. [Recd. May 1931.]

In December 1929, wheat in the province of Buenos Aires was infested to the extent of 1–4 per cent. by the larvae of a weevil, possibly *Prosalidus rufus*, Hust., though the adult was not obtained, that had probably migrated from some native graminaceous plant. The larva is described in detail. The eggs are laid in cavities bored in the green stems of wheat near the ground, the only sign of infestation being a discolouration round the wound. The larva bores into the hollow centre of the stem and mines in it, eventually making an exit hole underground and pupating in the soil. By mid-December 90 per cent. of the larvae had left the stems.

Smith (K. M.). *Thrips tabaci* **Lind. as a Vector of Plant Virus Diseases.**—*Nature*, cxxvii, no. 3214, pp. 852–853, 3 figs., 3 refs. London, 6th June 1931.

A virus disease that caused concentric circles on the leaves of *Solanum capsicastrum* in Cardiff was artificially transmitted to various plants, including tobacco, on which it produced a typical ringspot. It was also found to be transmitted by *Thrips tabaci*, Lind., this being the first record of virus transmission by Thysanoptera in the British Isles. Tomato plants from the vicinity of Cardiff have recently been found to be infected with spotted wilt, a disease that is of importance in Australia, where it is transmitted by *Frankliniella insularis*, Frankl. [*R.A.E.*, A, xviii, 666]. Experiments have shown that this disease is also transmitted by *Thrips tabaci*.

A study of the plants attacked and symptoms caused by the two viruses offers almost conclusive evidence that the causal organism in each disease is the same. Dahlia plants affected with a virus disease that causes concrete circles on the leaves occur commonly in the vicinity of tomatos infested with spotted wilt. Inoculation from such dahlias to tobacco and *Datura* caused symptoms indistinguishable from those produced in these plants by spotted wilt or by ringspot of

S. capsicastrum. In view of the seriousness of spotted wilt in Australia and the fact that *T. tabaci* is prevalent in glasshouses in England, it is suggested that a watch should be kept for the appearance of the disease.

FRANSEN (J. J.). **Enkele gegevens omtrent de verspreiding van de door** *Graphium ulmi* **Schwarz veroorzaakte iepenziekte door de Iepenspintkevers,** *Eccoptogaster (Scolytus) scolytus* **F. en** *Eccoptogaster (Scolytus) multistriatus* **Marsh in verband met de bestrijding dezer ziekte.** [Some Data on the Spread by the Cambium Beetles, *Scolytus scolytus* and *S. multistriatus*, of the Elm Disease due to *G. ulmi* in Connection with the Control of the Disease.]—*Tijdschr. Plantenziekt.*, xxxvii, no. 3, pp. 49–62, 3 pls., 5 refs. Wageningen, March 1931. (With a Summary in German.)

As *Scolytus (Eccoptogaster) scolytus*, F., has been found to carry *Graphium ulmi*, the causal agent of Dutch elm disease [*R.A.E.*, A, xviii, 177], a study of its biology was made in Holland in 1930, together with preliminary observations on *S. multistriatus*, Marsh. It was found that the adults of *S. scolytus* may appear at any time from early spring until late autumn whenever the weather is favourable, as various generations overlap without any clear interval. It is therefore evident that elms are exposed to infection by *G. ulmi*, which was observed to follow maturation feeding, throughout the summer. Various types of maturation feeding on elm and other trees by *S. scolytus* and *S. multistriatus* are discussed. It usually continues for about ten days.

Attempts to destroy the beetles by sprays containing lead arsenate were not successful, but freshly felled trap trunks proved very attractive. Their bark must be removed within five weeks and should preferably be burnt, for the beetles can work their way through sixteen inches of sandy soil and remain alive for days in submerged trunks. The Braconid, *Coeloides scolyticida*, Wesm., was the most important of 9 parasitic Hymenoptera bred from both Scolytids, the rate of parasitism of the larvae being sometimes as high as 89 per cent. The larvae were also parasitised by a Nematode, *Rhabditolaimus leuckarti*, and numbers were destroyed by woodpeckers and tits.

ELLER (C.). **Schädliches Massenauftreten von** *Pyrameis cardui* **L.** [Injurious Outbreak of *P. cardui*.]—*Int. ent. Z.*, xxv, no. 13, pp. 136–137. Guben, 8th July 1931.

Serious damage by *Pyrameis cardui*, L., to a field of soy beans [*Glycine hispida*] is recorded from Bavaria.

QUILIS PÉREZ (M.). **Especies nuevas de Aphidiidae españoles (Hym. Brac.).**—*Eos*, vii, no. 1, pp. 25–84, 98 figs. Madrid, 15th March 1931.

The species described include many of economic importance. A new subfamily, GYNOCRYPTINAE, is established for *Gynocryptus pieltaini*, gen. et sp. n., parasitising an Aphid on peas. *Aphidius gomezi*, Quilis, and *A. janinii*, Quilis [*R.A.E.*, A, xix, 277] are both referred to *Lysiphlebus*. The black Aphid on artichoke (*Cynara*) from which the latter was described [*loc. cit.*] is here stated to be *Aphis neoreticulata*, Theo. *Aphidius affinis*, sp. n., is also described from this Aphid, and *Aphidius beltrani*, sp. n., and *A. macropterus*, sp. n., from *Macrosiphum*

granarium, Kby., infesting oats. Other new species are *A. discrytus*, from a green Aphid on artichoke; *Pauesia* (gen. n.) *albuferensis*, from pine Aphids, probably *Neochmosis* (*Lachnus*) *pini*, L.; *Diaeretus napus*, from *Pergandeida quilisi*, Fresca, on turnip, radish and pea; *Trioxys granatensis*, from an Aphid on pomegranate; and *T. complanatus*, from a black Aphid on peas. *Aphidius granarius* var. *pailloti*, n., which was not observed in Spain, was obtained from *Macrosiphum dirhodum*, Wlk., on wheat in southern France.

Candura (G. S.). **La vita e i danni di alcuni insetti del frumento.** [The Biology of, and Damage caused by, some Insect Pests of stored Cereals.]—*Boll. Soc. Nat. Napoli*, xlii (1930), pp. 143–167, 7 figs., 4 refs. Naples, 10th April 1931.

An account is given of the bionomics of *Sitotroga cerealella*, Ol., *Plodia interpunctella*, Hb., *Calandra granaria*, L., and *Tenebroides mauritanicus*, L., the most important insect pests of stored cereals in Italy [*cf. R.A.E.*, A, xvii, 601]. It has been estimated that the average annual loss in Italy caused to cereals by them amounts to over £10,000,000.

[Pyatakova (V. L.).] **Пятакова (В. Л.). To the Biology of the Case-bearers (Coleophorae) of Fruit-trees.** [*In Russian.*]—*Bull. Mleev Hort. Expt. Sta.*, no. 45, 24 pp., 31 figs., 27 refs. Mleev, 1931. (With a Summary in English.) Price 75 *kop.*

Considerable damage to fruit trees in the Mleev district of the Kiev Government has recently been caused by species of *Coleophora*, of which *C. badiipennella*, Dup., was predominant in 1926, *C. hemerobiella*, Scop., in 1927, and *C. nigricella*, Steph., in 1928. Descriptions are given of all stages and the larval cases of these species and *C. anatipennella*, Hb.; the last-named and *C. flavaginella*, Zell., were rare.

In the Kiev Government, the life-cycle of *C. hemerobiella* lasts two years. The adults are on the wing in mid-July. Eggs are laid along the veins on the lower surface of the leaves of apple, pear and cherry, being embedded among the hairs, and hatch in 10–15 days. The young larvae mine in the leaves, from which they construct their protective cases about the end of August. They enter hibernation in late September or early October at the base of the shoots or buds, usually on branches 2–3 years old, and in the following April begin to attack the buds and young leaves. In June they enter aestivation, which passes into hibernation. In the following April they feed again and make new cases. About the end of May or beginning of June they attach themselves to twigs, on which they remain motionless for about 2–3 weeks before pupating. The pupal stage lasts 2–3 weeks.

The habits of the other species discussed are to a large extent similar to those of *C. hemerobiella*, but all of them complete development in one year. *C. nigricella* occurs on apple, pear, plum, apricot, peach, quince and cherry. The adults, which live 1–2 weeks, are on the wing in late June or early July. The adults of *C. anatipennella*, which attacks apple and occasionally pear, appear in the beginning or middle of June and the eggs are deposited singly on the upper or lower surface of the leaves. *C. badiipennella* occurs on apple and cherry, the adults emerging in mid-July. The overwintered larvae stop feeding in early May.

The only parasites reared from larvae of *Coleophora* were *Hemiteles* (*Hemimachus*) *coelebs*, Ratz., in 1925 and an unidentified species in 1930. Control measures are briefly reviewed from the literature [*R.A.E.*, A, xi, 77 ; xvii, 327].

[Krasnyuk (P. I.).] **Краснюк (П. И.). To the Control of the Cabbage Root Maggot** (*Phorbia brassicae* **Bouché**). [*In Russian.*]—*Bull. Mleev Hort. Expt. Sta.*, no. 47, 58 pp., 44 figs., 27 refs. Mleev, 1931. (With a Summary in English.) Price 1 *Rub.* 40 *kop.*

Notes are given on the bionomics of *Phorbia brassicae*, Bch. (cabbage fly), based partly on the literature [*R.A.E.*, A, xv, 648 ; xvi, 279, 412, etc.], and partly on observations carried out in 1926–1930 in the Kiev Government, where there are probably two full generations in a year and a partial third, hibernation occurring in the pupal stage in the soil at a depth of about 5–8 ins. Serious injury to cabbage is caused by the first generation only, especially at the time of transplanting ; in years of outbreaks the entire crop may be lost. The eggs were found in the soil close to the stems of the cabbages, and the egg and larval stages lasted 6–9 and 19–32 days respectively.

Five years of experiments on control are described in detail, the cost of each treatment being estimated. Raking the soil from the seedlings to remove any eggs and raising the earth in small hills round each plant did not encourage the formation of new roots [*cf.* xvii, 646], and resulted in a slight increase in infestation, possibly because the flies oviposited more readily in the friable soil. Other measures that proved valueless in protecting the plants were placing chopped straw [*cf.* xiii, 378] or sawdust round them or applying soap solution, emulsions of kerosene or carbolic acid, or tobacco dust or extract. Both tobacco dust and extract stimulated the growth of the plants, however, and thus increased the yield. Paradichlorobenzene applied at intervals to the seedlings at the rate of 1 gm. to a plant severely scorched the cabbages and greatly reduced the yield.

Naphthalene (0·8 gm. to each plant) applied five or six times at intervals of 7–8 days proved to be an excellent repellent, only 2·5 per cent. of the treated plants being killed by the larvae as compared with 14·1 per cent. in the control beds. It also stimulated the growth of the plants, but is too expensive for general use, as is also mercury bichloride, which was applied 3–5 times at intervals of 7–9 days in concentrations of 1–2 : 1,200, at the rate of 100 cc. to each plant and gave a very satisfactory control and increase in crop. Tarred paper disks applied round the bases of the stems proved of great value, only 2·5 per cent. of the plants being destroyed. They also prevented the soil round the plants from drying out, which resulted in a considerably increased crop. Watering with a proprietary tar distillate (0·4 or 0·2 per cent.) did not injure the plants. When three applications were made at intervals of 7–9 days at the rate of about 120 cc. to a plant, only 1·3 and 3·3 per cent. respectively were injured by *Phorbia*, and the crop was considerably increased. Dosages of 2 and 1 per cent. scorched 18·4 and 14·6 per cent. of the plants respectively when applied during hot and dry weather, but not in wet. The author considers tar distillate to be the best means of controlling *P. brassicae*.

Limited experiments in catching the adults on sheets of fly-paper of different colours showed that they are decidedly attracted to yellow.

[Luk'yanovich (F. K.).] **Лукьянович (Ф. К.). Practical Key to Weevils occurring in Beet Plantations.** [*In Russian.*]—Roy. 8vo, 45 pp., 25 figs. Kiev, Nauchn. Inst. Selektz. Soyuzsakh. [Sci. Inst. Select. Sugar Union], 1930. Price 75 *kop.* [Recd. June 1931.]

This key deals with the weevils occurring in the chief beet-growing regions of the Russian Union and includes not only species that attack beet but also those found on allied plants or in ditches round the beet fields. It is preceded by a brief discussion of the morphology of weevils in general, and the feeding habits of the adults and larvae.

[Borisevich (G. F.).] **Борисевич (Г. Ф.). Mosaic of the Leaves of Sugar Beet.** [*In Russian.*]—*Mosaic Diseases of the Sugar Beet, Magazine of Articles*, pp. 141–160, 2 graphs, 1 pl., 10 refs. Kiev, Izd. S.S.U. Soyuzsakhara [Pub. Plant Breed. Dept. Sugar Union], 1930. (With a Summary in English.) [Recd. June 1931.]

A section of this paper (pp. 152–155) deals briefly with the problem of vectors of mosaic disease of sugar-beet. The author believes that other insects, in addition to *Aphis fabae*, Scop., may transmit it [*cf. R.A.E.*, A, xvii, 9 ; xix, 388]. In western Ukraine in 1928 the percentage of the diseased beets in experimental plots steadily increased from the middle of July till the end of September, though *A. fabae*, which in the beginning of July infested 77 per cent. of the plants, disappeared at the end of the month. Other insects found on beet throughout the summer were *Poeciloscytus cognatus*, Fieb., *Deltocephalus striatus*, L., and *Cicadula sexnotata*, Fall., which were abundant in the beginning of September ; *Empoasca* (*Chlorita*) *flavescens*, F., which was very numerous in mid-September ; and *Lygus pratensis*, L., which was common in the second half of the month. The fact that beet was severely infected with mosaic in 1927, when there was a serious outbreak of *Tetranychus telarius*, L., and *A. fabae* infested only 3–5 per cent. of the plants, suggests that the disease may be transmitted by this mite. In view of the possibility that insects may transmit the disease to beet from other plants, a list is given of 16 plants found by the author to be infected with mosaic. Of these, beans (*Vicia faba*) and *Chenopodium album* were readily attacked by *A. fabae, L. pratensis* and *T. telarius*. The percentage of infection of first-year beet was found to decrease in proportion to the distance of the plants from infected beet grown for seed, 55 per cent. being infected in mid-July and 100 per cent. at the end of September at a distance of 3 ft., as compared with 10 and 80 per cent., respectively, at a distance of 16 ft.

Measures for preventing the spread of the disease include the cultivation of first-year beet at a distance of the not less than 330 yards from the beet grown for seed, and the destruction of the pests.

[Semenov (A. E.).] **Семенов (А. Е.). Pests of Makhorka Tobacco.** [*In Russian.*]—Med. 8vo, 32 pp., 29 figs., 5 refs. Moscow, Gosud. tekhn. Izd., 1930. Price 65 *kop.* [Recd. May 1931.]

An account is given of observations carried out in 1928 in the Poltava Government on insects attacking "makhorka" tobacco [*Nicotiana rustica*], which is extensively cultivated in the Ukraine. The chief damage was caused by *Corymbites* (*Selatosomus*) *latus*, F., the larvae of which attack the stems underground, cutting them through, boring

into them, or feeding externally, according to the age of the plants. Infestation by this wireworm was more severe on high ground ; it is estimated that if it amounts to 6 larvae to 11 sq. ft., 30 per cent. of the plants may be destroyed. As summer advances and the upper layers of the soil become dry, the larvae penetrate deeper into the ground, where they feed on the thin roots only and cause little if any damage. For this reason, tobacco planted as late as the second half of June was practically uninjured. Baits of rape oilcake or of a paste of roasted wheat bran, water and a little molasses were very effective in attracting the larvae, no tobacco plants being attacked in fields where these baits were applied at intervals of 40 ins. in holes 2–3 ins. deep. The larvae did not feed on baits to which sodium arsenite had been added. The destruction of all infested plants may be of value, as about 25 per cent. of the larvae occur inside the stems, from which they migrate to healthy plants if left in the field.

The larvae and adults of *Tettigonia viridissima*, L., attacked the leaves of young and mature tobacco plants, being especially injurious at the period when only 7 or 8 leaves are left for harvesting. On plants grown for seed they feed on the flowers and partly hollow out the immature seed heads. *Thrips tabaci*, Lind., caused serious damage in August, and was also probably responsible for the transmission of a disease of the leaves caused by *Bacterium tabacum*, which is very common in the district. Clean cultivation is recommended for the control of the thrips. The overwintered adults of *Tanymecus palliatus*, F., destroyed the young seedlings, so that in some places the fields had to be replanted 3 or 4 times. The weevils feed on the leaves, chiefly at night ; infestation of the more mature plants is unimportant, as only the lower leaves, which are usually removed, are attacked. *Gryllotalpa gryllotalpa*, L., destroyed tobacco plants in greenhouses and in plantations cultivated in damp places. The crickets may be attracted for hibernation by trap holes 18 ins. deep filled with dung and destroyed in the spring. Poison baits of 10–15 parts pounded maize or wheat flour to 1 part arsenic should be broadcast in infested fields at intervals of 14 ins. The adults and larvae of *Therapha* (*Corizus*) *hyoscyami*, L., and *Dolycoris baccarum*, L., were present in numbers on the leaves and seed heads, causing punctures and brown stains ; eggs were laid on the plants from mid-June till the end of August. The larvae of the first generation of *Euxoa segetum*, Schiff., caused severe injury to tobacco in June and July, particularly in fields that had been covered with weeds in the preceding year or had been planted late. *Phytometra gamma*, L., occurred throughout the whole summer. The eggs of the first generation were deposited on the leaves of tobacco from the end of June, and the larvae pupated at the end of July, the adults first appearing on 8th August. The first generation usually develops on weeds, which should be destroyed in and round tobacco fields.

Less important pests were *Myzus* (*Myzodes*) *persicae*, Sulz., *Philaenus spumarius*, L., *Acucephalus nervosus*, Schr., *Polia suasa*, Schiff. (*dissimilis*, Knoch), which has not been previously recorded as injurious to tobacco, *Amphipyra tragopoginis*, L., *Pedinus femoralis*, L., and *Opatrum sabulosum*, L.

As a supplement, brief notes are given on the bionomics and control of *Loxostege sticticalis*, L., a serious outbreak of which occurred in the Ukraine in 1929. In the Poltava Government there are two generations a year, and sometimes a partial third. Severe damage to tobacco was caused by the larvae of the first generation in June.

[Batiashvili (I. D.).] **Батиашвили (И. Д.). Comparative Tests of Insecticides on the Caterpillar of** *Hyponomeuta malinellus* **Zell.** [*In Russian.*]—*Bull. Sci. Res. Inst. U.S.S.R. Tree and Small Fruit Cult., Sect. Plant Prot.* (*Ent.*), no. 3, 39 pp., 5 diag., 26 refs. Kiev, 1931.

A detailed account is given of laboratory and field experiments with insecticides against the larvae of *Hyponomeuta malinellus*, Zell., on apples, carried out in May and early June 1930 in the Kiev Government. The first tests were conducted against the second instar larvae soon after they appeared on the surface of the leaves, at which time the trees were flowering. They consisted in dusting the infested branches with calcium arsenate or arsenite, either pure or mixed with 5, 10 or 15 parts talc. The calcium arsenite killed all the larvae, but severe injury to the foliage and flowers was caused in all cases. Calcium arsenate destroyed 90–100 per cent. of the flowers, and when used pure or with 5 parts talc scorched 7–8 and 2 per cent. of the leaf surface respectively, the highest rate of mortality of the larvae being 52·8 per cent.

In a second series of tests sprays were used against the third instar larvae. Calcium arsenite in various concentrations killed almost all the larvae, but scorched 15–90 per cent. of the leaf surface, whereas Paris green, at the rate of 1 lb. with 2 lb. freshly slaked lime in 100 gals. water killed 97·9 per cent. of the larvae and injured only 2 per cent. of the foliage. Sprays of 1 per mille nicotine sulphate and 5 per mille soft soap killed 85·8 per cent. of the larvae, the mortality increasing to 95·9 per cent. when double the amount of the soap was used. Nicotine and soap in the same concentrations killed 96·9 and 98·2 per cent. respectively.

The third series of tests was carried out against larvae of the fourth instar. Frequent rains washed off the dusts or sprays, and owing to the prevailing cold, the larvae did not feed readily. Pure calcium arsenite dust killed 92·1 per cent. but scorched 75 per cent. of the leaf surface. The injury decreased to 3–4 per cent. and the mortality to 76 per cent. when the arsenite was mixed with 25 or 30 parts talc. Of the sprays, 1 per mille nicotine sulphate and 10 per mille soap killed 89·3 per cent. of the larvae. Calcium arsenite was the next in effectiveness, 71·9 per cent. being destroyed by a spray of 4 lb. to 100 gals. water with the addition of sifted flour, but 25 per cent. of the leaf surface was injured. Spraying with 1 per mille sodium fluosilicate with the addition of flour as a spreader killed 49 per cent. of the larvae, only 2 per cent. of the foliage being scorched. The addition of lime to the spray increased the injury to the leaves [*cf. R.A.E.*, A, xvi, 523].

Chiaromonte (A.). **Considerazioni entomologiche sulla coltura del Cotone nella Somalia Italiana.** [Entomological Notes on Cotton Growing in Italian Somaliland.]—Communicazione al Congresso di Agricoltura Tropicale di Anversa, Luglio 1930. 7 pp.

The pests of cotton in Italian Somaliland discussed include the Eumolpid, *Syagrus rugiceps*, Lef., the larvae of which do serious harm to the roots, often killing full-grown, vigorous plants; *Heliothis* (*Chloridea*) *obsoleta*, F., the larvae of which attack the flower-buds and and flowers, but are parasitised by *Sarcophaga* sp., *Sturmia inconspicua*, Mg., and *Gonia bimaculata*, Wied.; *Platyedra gossypiella*, Saund., which is the most injurious pest, although it is not distributed in the

seed, as the long cycle form does not occur, and the larvae are parasitised by *Microbracon kirkpatricki*, Wlkn., and *Chelonella curvimaculata*, Cam.; and *Dysdercus cardinalis*, Gerst., and *Oxycarenus hyalinipennis*, Costa, which are the most important of the Rhynchota, though the Jassid, *Empoasca facialis*, Jac., aggravates a condition of the plant due to other factors that results in the leaves curling or even falling.

TROCHAIN (J.). **La " lèpre " de l'arachide au Sénégal.**—*Rev. Bot. appl.*, xi, no. 117, pp. 330–334. Paris, May 1931.

Rosette disease of ground-nuts in Gambia appears to be transmitted by two Jassids of the genus *Cicadulina*, and in South Africa the vector is *Aphis leguminosae*, Theo. [*R.A.E.*, A, xvii, 49]. In the Experiment Station of Thiès, inoculation experiments were carried out with material from infected plants, but the results were negative. It is frequently observed that late-sown plants suffer much more from the disease than those sown at the time of the first rains, and this has been explained by greater activity of *Cicadulina* spp. between mid-July and mid-August [*loc. cit.*].

JACK (R. W.). **Report of the Chief Entomologist for the Year 1930.**—*Rep. Secy. Dept. Agric. S. Rhodesia 1930*, pp. 65–73. Salisbury, 1931.

During investigations on the overwintering habits of the larvae of *Busseola* (*Glottula*) *fusca*, Fuller, on maize in Southern Rhodesia, it was found that there was no definite migration to the roots, approximately 85 per cent. of the larvae hibernating above the ground level in the stalks. Maize planted early as a trap crop did not afford the usual amount of protection [*cf. R.A.E.*, A, xviii, 532], as it germinated about the same time as the main crop owing to the lateness of the rains.

Other pests recorded in 1930 include *Laphygma exempta*, Wlk. [xix, 57], *Heliothis obsoleta*, F., *Heteronychus foveolatus*, Jack, and *Tanymecus destructor*, Mshl., on maize; *Engytatus volucer*, Kirk., *Myzus persicae*, Sulz., *Phthorimaea heliopa*, Lw., and *Trachynotus* sp. on tobacco; and *Scirtothrips aurantii*, Faure [*cf.* xviii, 701] and *Heliothis obsoleta* on *Citrus*. Cotton was damaged by *H. obsoleta*, and attempts are being made to control it by means of trap crops, hand collection and the egg parasite, *Trichogramma lutea*, Gir. Swarms of *Nomadacris septemfasciata*, Serv. (red-winged locust) were observed, but apparently left the Colony without ovipositing.

MOUTIA (A.). [**Insect Pests in Mauritius in 1929.**]—*Ann. Rep. Dept. Agric. Mauritius 1929*, pp. 4–6. Port Louis, 1931.

Pests occurring in Mauritius in 1929, in addition to some of those mentioned in the previous report [*R.A.E.*, A, xviii, 559], include the following on sugar-cane: *Aphis sacchari*, Zehnt., which was controlled by Coccinellids, Syrphids and a Hymenopterous parasite, and was also attacked by an entomogenous fungus; *Neomaskellia* (*Aleurodes*) *bergi*, Sign., which infested seedlings; *Pulvinaria iceryi*, Guér. (*gasteralpha*, Sign.), which was observed in small numbers on cane grown in greenhouses, but did little damage owing to the presence of a Chalcid parasite; and *Nomadacris septemfasciata*, Serv. ph. *solitaria* (*Acridium coangustatum*, Luc.), which occurred over an area of 100 acres, but was

attacked by large numbers of the insectivorous bird, *Acridotheres tristis*. The situation with regard to *Lachnosterna* (*Phytalus*) *smithi*, Arrow, has been noticed elsewhere [xviii, 429; xix, 377]. Tobacco was damaged by *Phthorimaea operculella*, Zell. [xviii, 104], and the seedlings by *Prodenia litura*, F., and *Gryllotalpa africana*, P. de B. On coconut *Aspidiotus destructor*, Sign., is still a major pest, but was attacked by two Chalcids, two Coccinellids and a Nitidulid, 40 per cent. of the Coccids being parasitised by the Chalcids in various localities.

Other pests included *Thrips tabaci*, Lind., on onions [xviii, 338], *Cosmopolites sordidus*, Germ., on banana, *Pinnaspis minor*, Mask., on aloes, *Crambus emmerezellus*, de Joannis, damaging lawns, *Tetranychus* sp. on tomato, egg-plant, etc., *Agromyza phaseoli*, Coq., on beans, *Crocidolomia binotalis*, Zell., on crucifers, and termites in buildings. The propagation of *Dactylopius opuntiae*, Ckll. (*Coccus tomentosus*, auct.), which is being continued, has resulted in the infestation of more than 300 acres of prickly-pear in one locality and the results are extremely promising.

[Rusinov (D. I.).] **Русинов (Д. И.).** *Schistocerca* **in Persia.** [*In Russian.*]—*Zakhlopkov. Nezavisim.* [formerly *Khlopkovoe Delo*], no. 1, pp. 84–87, 1 map. Tashkent, January 1931.

Records are given of the distribution of swarms of *Schistocerca gregaria*, Forsk., in Persia in 1930.

Darragh (W. H.). **Fumigation of Seed Maize.**—*Agric. Gaz. N.S.W.*, xlii, pt. 5, pp. 377–378. Sydney, May 1931.

Fumigation, for which carbon bisulphide is generally used, and subsequent storage in insect proof tins are considered necessary to preserve seed maize from weevil attack on the north coast of New South Wales. Newly harvested maize usually contains too much moisture for shelling and safe storage as shelled grain, but owing to the presence of the weevils in the ear it may be necessary to treat it to prevent further injury. Germination has not always proved satisfactory after such fumigation, and tests were therefore carried out to determine its safety. Samples of seed maize of varying moisture contents were fumigated with carbon bisulphide under different conditions of temperature, amount of fumigant and period of exposure, and their germination was compared with that of seed held for similar periods in a closed tin. As a result, it appears that if it is necessary to fumigate maize containing a high percentage of moisture, nothing stronger than 5 lb. carbon bisulphide per 1,000 cu. ft. should be used, for not more than 48 hours, preferably in cool weather. The seed should be thoroughly aired after fumigation.

Jarvis (E.). **Some Coleoptera of minor Importance injuring Sugar-cane in North Queensland.**—*Queensland Agric. J.*, xxxv, pt. 4, pp. 218–223, 3 figs. Brisbane, April 1931.

Brief notes are given on *Anomala antiqua*, Gyll. (*australasiae*, Blkb.), *Cacochroa decorticata*, Macl., and *Dasygnathus australis dejeani*, Macl., all stages of which are described (with the exception of the egg of *C. decorticata*).

Roberts (F. H. S.). **The Bacon Fly or Ham Skipper.**—*Queensland Agric. J.*, xxxv, pt. 4, pp. 227–229, 2 figs. Brisbane, April 1931.

In 1930, *Piophila casei*, L., was prevalent in all bacon factories in Queensland and, except where control measures were strictly maintained, severe losses were experienced. This fly, which is cosmopolitan, breeds in bacon, cheese, dried fish and flesh, and carrion. The eggs are usually deposited singly on bacon, particularly in cracks and broken surfaces, and at 65° F. hatch in 30–48 hours. The maggots burrow in the fatty tissues of the cured product. At 65–95° F. the larval period occupies 8–15 days and the pupal 7–12, pupation occurring under the bacon cloth or in dark places in the storeroom.

Control measures should be maintained as long as the flies are observed. Hygienic conditions should be enforced in and around the factory, and all bacon returned as infested should be immediately destroyed without opening. Bacon should be wrapped as soon as possible after curing, and the cloth kept firm and smooth; it should not be kept for any length of time except in cold storage, temperatures of 30–36° F. killing all stages except perhaps the eggs. Screening helps in keeping flies out of the factory, a 24–30 mesh gauze being used.

Muggeridge (J.). **Notes on three Insect Pests. Willow-leaf Saw-fly, Cyclamen Weevil, and Cutworm.**—*N.Z. J. Agric.*, xlii, no. 4, pp. 231–235, 7 figs. Wellington, N.Z., April 1931.

The sawfly, *Pontania proxima*, Lep., has recently become well established in New Zealand. The galls it forms on the leaves of willow are said to be due to an albuminous secretion containing an enzyme injected at the time of oviposition, a view supported by the fact that they will develop even if the eggs are killed. The larva emerges from the gall to pupate in a cocoon on the leaf. Reference is made to the occurrence of the polyphagous weevil, *Otiorrhynchus* (*Brachyrrhinus*) *sulcatus*, F., as a potential orchard pest in New Zealand, where it was first recorded in 1889, though it does not appear to have attracted much attention there. Brief notes are given on its bionomics and control in other countries. *Melanchra mutans*, Walk., an indigenous cutworm, is very abundant throughout the country. It has acquired the habit of living on the foliage and young fruit of apple, but in the event of its becoming of economic importance, it should be readily controlled by the lead arsenate spray used against the codling moth [*Cydia pomonella*, L.].

Commun (R.). **Travaux d'entomologie.**—*Bull. écon. Indochine*, xxxiii, no. 3 B, C.R. Trav. 1928–29, ii-Ent. Cryptog., pp. 1–28, 2 pls. Hanoi, 1930.

With reference to a recent abstract of this paper [*R.A.E.*, A, xix, 24], the author states that the meaning of the passage dealing with the habitats of Lepidopterous pests of rice in Indo-China observed in April 1928 is that larvae of *Cnaphalocrocis medinalis*, Guen., and of *Chilo simplex*, Butl., were found in the stalks of rice, and adults of *Precis atlites*, Johansson, on the stalks.

Malloch (J. R.). **Exotic Muscaridae (Diptera).—xxxi.**—*Ann. Mag. Nat. Hist.*, (10) vii, no. 38, pp. 185–200, 4 refs. London, February 1931.

Sewill (J. W.). **Life Cycle of a Fly Pest (Anthomyiid), on** *Nipa fruticans*.—*Malayan Agric. J.*, xix, no. 5, pp. 233–235, 3 figs., 1 ref. Kuala Lumpur, May 1931.

The new flies described in the first paper include *Phaonia corbetti*, the bionomics of which are discussed in the second. It infests *Nipa fruticans* in Malaya, the eggs being laid in groups of 20 or more under the sheath of the unopened male inflorescence. The method of oviposition is described. The maggots, which hatch in 24 hours, bore into the male flowers and feed inside the stems. In captivity, maggots in decaying stems showed no inclination to migrate to fresh ones. The short-stemmed male flowers surrounding the female inflorescence are usually attacked first, as they open before those with long stems that originate lower down the female stem ; they also constitute a greater danger as the larvae rapidly eat their way down into the female stem so that the young fruit is killed. The larval and pupal stages each last about 10 days, pupation usually occurring just below the surface of the soil, but in some cases in the long male stems.

Natural enemies include spiders, which often surround the flowers with their webs, and ants, which carry off the eggs and young larvae. Artificial cross pollination of the flowers, followed by removal of the male flowers, those with the short stems being cut off as soon as possible, seems to be an effective control measure.

Kuijper (J.). **Verslag van het Deli Proefstation over het jaar 1930.** [Report of the Deli Experiment Station, Sumatra, for 1930.]—*Meded. Deli Proefst.*, (2) no. 68, 64 pp. Medan [1931].

Part of this report deals with the insects attacking tobacco. Experiments in dusting against Lepidoptera have already been noticed [*R.A.E.*, A, xviii, 655, 676]. Dusting in the field reduces the injury to the tobacco leaves in the drying sheds. Infestation by *Heliothis assulta*, Gn., *Phytometra* (*Plusia*) [*signata*, F.], and *Prodenia* [*litura*, F.] was slight in general, but the last-named was very abundant in places. *H. assulta* does not appear to occur on *Mimosa*, which is infested by *H. obsoleta*, F., but it is much more numerous on tobacco than the latter. *Myzus persicae*, Sulz., was unusually abundant, and large amounts of derris extract were used to combat it. *Phthorimaea* [*operculella*, Zell.] and the tobacco capsid, *Engytatus tenuis*, Reut., were common.

Jacques (C.). **Un ennemi important du bananier en Nouvelle-Calédonie.**—*Rev. agric. Nouvelle-Calédonie*, 1931, pp. 352–355. Nouméa, March 1931.

In view of the suggested increase of banana production in New Caledonia for export purposes, a brief account is given of *Cosmopolites sordidus*, Germ. (banana weevil), which has recently begun to be troublesome, largely owing to the lack of clean cultivation after the crop has been gathered. An Elaterid predacious on it has been found at Cooroy.

Koidsumi (K.). **Quantitative Studies on the lethal Action of X-rays upon certain Insects.**—*J. Soc. Trop. Agric.*, ii, no. 3, pp. 243–263, 5 figs., 17 refs. Taiwan, December 1930.

The experiments described show that *Dacus cucurbitae*, Coq., and *D. dorsalis*, Hendel, can be killed by certain amounts of X-ray irradiation in any stage of their life-cycle, when exposed in Petri dishes. Their resistance to X-rays becomes higher and higher as development proceeds from egg to full grown larva. At the beginning of pupation resistance falls rapidly, and then progressive high resistance continues to the emergence of the adult.

Wilson (A. L.). **Triethanolamine Emulsions.**—*Indust. Engng. Chem.*, xxii, no. 2, pp. 143–146. Washington, D.C., February 1930.

Triethanolamine, the chemical and physical properties of which are described, has been shown to be suitable for general use in the preparation of emulsions and to have a number of advantages over the usual inorganic bases employed for this purpose. The most satisfactory method of preparing an emulsion with it is to dissolve in the oil or other material to be emulsified 6–20 per cent. of a fatty acid (of which oleic acid appears to be the most generally useful), which includes any free fatty acid naturally occurring in the oil, and mixing the solution with a 2–8 per cent. solution of triethanolamine in water. This method usually yields a spontaneous emulsion, which is converted by moderate agitation into a product of satisfactory stability. If a minimum of the water solution is used, the result is a concentrated emulsion that can be stored indefinitely without separation and may be readily diluted with water when required for use. The amounts of acid and base (triethanolamine) necessary to prepare emulsions of various oils and waxes are given in a table. With mineral oils of low viscosity, triethanolamine may be used to prepare miscible oils by adding 8–12 per cent. of oleic acid to the oil and subsequently stirring in 3–4 per cent. triethanolamine until solution is complete. In all cases a slight excess of acid over that required for solution of the base gives the most stable emulsion. Stable emulsions of kerosene for spraying purposes can be made that contain up to 85 per cent. of the oil and are readily dilutable with water. For oil sprays triethanolamine has the additional advantage of low alkalinity, which should reduce scorching of the foliage. The low surface tension of the emulsion makes it especially suitable for obtaining uniform coverage of foliage and satisfactory impregnation of scale insects.

Tobacco Pest Suppression Act, Southern Rhodesia, 1931.—2 pp. Salisbury, 1931.

The export of unmanufactured tobacco from Southern Rhodesia is prohibited except from licensed warehouses. Such a warehouse is subject to inspection at any time, and its licence may be suspended if it is infested by *Ephestia elutella*, Hb. [*cf. R.A.E.*, A, xviii, 532] or the tobacco weevil [? *Lasioderma serricorne*, F.].

Wilke (S.). **Ueber die Bedeutung tier- und pflanzengeographischer Betrachtungsweise für den Fortschutz. I. Dargestellt an** *Lymantria monacha* **L.,** *Ips typographus* **L., und** *Hylurgops glabratus* **Zett.** [On the Significance in Forest Protection Work of the zoo- and phytogeographical Point of View. I. Exemplified by *L. monacha, I. typographus* and *Hylastes glabratus*.]—*Arb. biol. Reichsanst. Land- u. Forstw.*, xviii, no. 5, pp. 583–675, 3 figs., 8 maps, 581 references. Berlin, February 1931.

The present tendency of investigations is to minimise the importance of biological factors in the natural control of outbreaks of insect pests, climatic conditions being regarded as the sole, or almost sole, cause of the beginning and end of such outbreaks. To illustrate this point of view, detailed consideration is devoted to outbreaks of *Lymantria monacha*, L., *Ips typographus*, L., and *Hylastes* (*Hylurgops*) *glabratus*, Zett., on spruce. Their food-plants and geographical distribution in Europe are discussed. In the case of *L. monacha*, it is only spruce forests in the deciduous tree zone that are susceptible to attack. The great importance of this moth in Central Europe is solely due to immoderate planting of pure stands of spruce outside the natural area of distribution of the latter [*cf. R. A. E.*, A, xix, 328]. *I. typographus* finds its optimum environment in the deciduous tree zone, where it is endemic in spruce forests, but unlike *L. monacha*, it does occasionally increase to large numbers in the real spruce zone. In Central Europe, however, its importance is also due to over extensive planting of spruce outside the natural spruce region, for it is then that primary causes, such as climate or infestation by the nun moth, give rise to conditions favourable to it. *H. glabratus* is a typical spruce bark-beetle, which causes little injury, its optimum environment being the real spruce zone, and its requirements as to climate and tree-condition being opposed to those of *I. typographus*.

Jancke (O.). **Die Kirschblütenmotte.** [The Cherry Blossom Moth.]—*Flugbl. Biol. Reichsanst. Land- u. Forstw.*, no. 101, 4 pp., 9 figs. Berlin, October 1930. [Recd. May 1931.]

A brief account is given of the bionomics and control of *Argyresthia ephippiella*, F., on cherry in Germany [*cf. R.A.E.*, A, xviii, 180, etc.].

Stellwaag (F.). **Die Milben- oder Kräuselkrankheit der Rebe und ihre Bekämpfung.** [The Mite or Leaf-crinkle Disease of Grapevines and its Control.]—*Flugbl. Biol. Reichsanst. Land- u. Forstw.*, no. 102, 4 pp., 6 figs. Berlin, January 1931.

A short account is given of the leaf-crinkle of grape-vines that is due to the gall mites, *Epitrimerus vitis*, Nal., *Phyllocoptes vitis*, Nal., and *P. viticulus*, Pant., with notes on their control [*cf. R.A.E.*, A, xviii, 385].

Sprengel (L.). **Die Pflaumensägewespen und ihre Bekämpfung.** [The Plum Sawflies and their Control.]—*Flugbl. Biol. Reichsanst. Land- u. Forstw.*, no. 114, 4 pp., 7 figs. Berlin, March 1931.

A brief account is given of the life-history, economic importance, and control of the plum sawflies, *Hoplocampa flava*, L., and *H. fulvicornis*, Panz. (*minuta*, Christ) in Germany [*R.A.E.*, A, xviii, 436].

KUWANA (I.). **On the Genus *Kermes* in Eastern Asia.** [*In Japanese.*] —*Kontyu*, v, pp. 47–51, 5 figs. Tokyo, 1931.

A list is given of the seven species of *Kermes* known in Japan, Formosa, Korea and China; they include *K. tomarii*, sp. n., described in English from *Quercus variabilis* in South Manchuria.

PAPERS NOTICED BY TITLE ONLY.

COLCORD (M.). **Index IV to the Literature of American Economic Entomology, January 1, 1925 to December 31, 1929.**—*Amer. Assoc. Econ. Ent.*, Spec. Pub. 4, [xii]+518 pp. Melrose Highlands, Mass., 1930. Price $5·50. [*Cf. R.A.E.*, A, xiii, 469.]

Horticultural Laws and Regulations of Oregon 1931.—Demy 18mo, 156 pp. Portland, Ore., St. Bd. Hort., 1931.

HASEMAN (L.). **Anatomy of the Hessian Fly Larva** [*Mayetiola destructor*, Say].—*J. Econ. Ent.*, xxiv, no. 2, pp. 417–419. Geneva, N.Y., April 1931.

HYSLOP (J. A.). **A simple Filing System for a State Insect Pest Survey.** —*J. Econ. Ent.*, xxiv, no. 2, pp. 463–465. Geneva, N.Y., April 1931.

YOTHERS (M. A.). **Tree Hoppers and their Control in the Orchards of the Pacific Northwest.**—*Circ. U.S. Dept. Agric.*, no. 106, corrected edn., 14 pp., 9 figs., 3 refs. Washington, D.C., March 1931. [*Cf. R.A.E.*, A, xviii, 370.]

BRITTON (W. E.). **Connecticut Laws concerning Plant Pests, Diseases of Bees and Mosquito Elimination.**—*Circ. Connecticut Agric. Expt. Sta.*, no. 73, 10 pp. New Haven, Conn., January 1931.

CHRISTIE (J. R.). **Some Nemic Parasites (Oxyuridae) of Coleopterous Larvae.**—*J. Agric. Res.*, xlii, no. 8, pp. 463–482, 14 figs., 9 refs. Washington, D.C., 15th April 1931.

CAESAR (L.) & THOMPSON (R. W.). **The European Corn Borer** [*Pyrausta nubilalis*, Hb.].—*Bull. Ontario Dept. Agric.*, no. 358, 19 pp., 15 figs. [Toronto] February 1931. [Revision of no. 334, *R.A.E.*, A, xvi, 575.]

CAESAR (L.). **Insects attacking Vegetables.**—*Bull. Ontario Dept. Agric.*, no. 359, 67 pp., 49 figs., 2 refs. [Toronto] April 1931. [Revision of no. 325, *R.A.E.*, A, xv, 608.]

KLYVER (F. D.). **Notes on the Chermidae** [Psyllidae] **(Hemiptera: Homoptera). Part II.** [Including descriptions of the nymphs of *Psylla pyricola*, Först., and *P. mali*, Schmidb.]—*Canad. Ent.*, lxiii, no. 5, pp. 111–115, 3 figs. Orillia, Ont., May 1931.

MERCET (R. G.). **Afelínidos paleárticos (Hym. Chalc.). 6a nota** [including *Aphelinus* (*Aphytis*) *abnormis*, How., recorded from *Leucodiaspis* (*Leucaspis*) *signoreti*, Targ., in Corsica].—*Eos*, vii, no. 1, pp. 5–7. Madrid, 15th March 1931.

MORISON (G. D.). **Observations on the Numbers of Mites, *Acarapis woodi* (Rennie) found in the Tracheae of the Honey-bee.**—*Bee Wld.*, xii, no. 7, pp. 74–76. Camberley, Surrey, July 1931.

LEIBBRANDT (F.). **Untersuchung über die Chemie der arsenhaltigen Schädlingsbekämpfungsmittel I.** [An Investigation on the Chemistry of arsenical Insecticides (in relation to injury to vines) I.]—*Weinbau u. Kellerw.*, ix, no. 21, reprint 5 pp. Freiburg i. Br., 1930. [*Cf. R.A.E.*, A, xix, 243.]

BODENHEIMER (F. S.). **Ueber dei Temperaturabhängigkeiten von Insekten. III. Die Beziehungen der Vorzugstemperatur zur Luftfeuchtigkeit der Umgebung.** [On the Influence of Temperature on Insects. III. The Relation of the optimum Temperature to the atmospheric Humidity of the Environment.]—*Z. vergleich. Physiol.*, xiii, no. 4, pp. 740–747, 2 figs., 6 refs. Berlin, 1931.

BALACHOWSKY (A.). **Contribution à l'étude des Coccides de France (5e Note). Faune de Corse.**—*Bull. Soc. ent. Fr.*, 1931, no. 7, pp. 96–102, 8 refs. Paris, 1931.

GOUX (L.). **Notes sur les Coccides (Hem.) de France (3e Note) Description d'une espèce nouvelle.**—*Bull. Soc. ent. Fr.*, 1931, no. 8, pp. 113–118, 2 figs. Paris, 1931.

PICARD (F.). **Les insectes de la carotte.** [A popular account, including brief notes on remedial measures and parasites.]—*Prog. agric. vitic.*, xcv, no. 21, pp. 492–498, 1 pl. Montpellier, 24th May 1931.

BOUVIER (E. L.) & RIEL (P.). **Catalogue des papillons séricigènes saturnioides.**—*Rapp. Lab. Etudes Soie*, xvii, pp. 1–90, 3 pls. Lyon, 1931.

JUDENKO (E.). **Data concerning the Fauna and Biology of Plant Lice (Aphididae) from the Surroundings of Pulawy. 2.** [In Polish with descriptions of new species in English.]—*Polsk. Pismo ent.*, x, pt. 2, pp. 102–118, 2 pls., 10 refs. Lemberg, 1931.

[NOVINENKO (A. I.).] **Новиненко (А. И.). Insects as Carriers of Mosaic Disease of Sugar Beet.** [*In Russian.*]—*Mosaic Diseases of the Sugar Beet, Magazine of Articles*, pp. 99–111, 3 figs., 2 diag., 19 refs. Kiev, Izd.S.S.U.Soyuzsakhara [Pub. Plant Breed. Dept. Sugar Union], 1930. (With a Summary in English.) [See *R.A.E.*, A, xix, 388.]

EGGERS (H.). **Zur Synonymie der Borkenkäfer (Ipidae, Col.). II** [including *Hypocryphalus mangiferae*, Stebbing 1914 (*mangiferae*, Eggers 1928)].—*Wien. ent. Ztg.*, xlvii, no. 4, pp. 184–186. Vienna, 30th March 1931.

GARDNER (J. C. M.). **Immature Stages of Indian Coleoptera (7 & 8)** [Cicindelids, Buprestids, Melasids, Elaterids, Tenebrionids, Cerambycids].—*Ind. Forest Records*, xiv, pt. 13, pp. 279–286; xvi, pt. 3, pp. 162–202, 6 pls., 6 refs. Calcutta, 1930–31.

LAING (F.). **A new Coccid injurious to Fruit Trees in Baluchistan.** [*Aspidiotus prunorum*, sp. n., on the bark of damson, almond and cherry.]—*Mem. Dept. Agric. India*, Ent. Ser., xii, no. 2, pp. 99–100, 1 pl. Calcutta, April 1931.

MISRA (A. B.). **On the internal Anatomy of the Female Lac Insect,** *Laccifer lacca* **Kerr (Homoptera, Coccidae).**—*Proc. Zool. Soc. Lond.*, 1931, pp. 297–323, 10 pls., 34 refs. London, 14th April 1931.

LIN (Shu-yen). **External Morphology of the Corn Ear Worm** [larva, pupa and adult of *Heliothis obsoleta*, F.].—*Lingnan Sci. J.*, vii (1929), pp. 697–714, 3 pls., 6 refs. Canton [1931].

FELT (E. P.). **Gall Midges or Gall Gnats of the Orient (Itonididae or Cecidomyiidae).**—*Lingnan Sci. J.*, vii (1929), pp. 413–474, 10 pp. refs. Canton [1931]. [The keys include genera of other regions.]

NINOMIYA (E.). **List of aphidiphagous Syrphids in Komaba, Tokyo.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi*, iii, pp. 129–131. Tokyo, 1931.

Dingler (M.). **Zur Biologie und Bekämpfung der tierischen Spargelschädlinge. Vorläufige Mitteilungen.** [On the Biology and Control of Asparagus Pests. Preliminary Report.]—*Anz. Schädlingsk.*, vii, no. 4, pp. 37–42, 6 figs. Berlin, April 1931.

Besides a number of minor pests, including *Phyllopertha horticola*, L., and *Agromyza simplex*, Lw., asparagus in Hesse is attacked by *Crioceris asparagi*, L., *C. duodecimpunctata*, L., and the Trypetid, *Platyparea poeciloptera*, Schr. In 1930, as many as five adults of *C. asparagi* were found on each plant on 30th April and up to seventy eggs per shoot on 1st May. *C. duodecimpunctata*, which appeared early in May, was the predominant species in June, *C. asparagi* again becoming more numerous afterwards. In spite of the slightly different dates of appearance, both beetles can be combated simultaneously by an arsenical dust. In the case of *P. poeciloptera*, control measures must be directed against the adults before they oviposit. The eggs are laid in the shoot, and the larvae, which hatch in about two days, mine downwards through it, and pupate in about a fortnight. A shoot may contain upwards of 20 larvae and pupae. The pupae hibernate in the slowly rotting shoot. Two-year-old plants are those chiefly attacked, and the infestation varies considerably in different years. Many methods of control were tried, and laboratory experiments showed that a contact dust insecticide, which will be discussed in a later paper, is effective. It should be applied early in the morning at the end of April, and again 4–5 weeks later.

Börner (C.). **Mitteilungen über Blattläuse.** [Communications on Aphids.]—*Anz. Schädlingsk.*, vii, no. 4, pp. 42–43. Berlin, April 1931.

This part of a series of papers [*R.A.E.*, A, xix, 378, 424] includes a discussion of the identity of the "apple grain aphis". The forms occurring in Europe and America, recorded under various names, are thought to be distinct, and the author inclines to the view that the correct names for them are *Rhopalosiphum crataegellum*, Theo., and *R. annuae*, Oestl., respectively.

Moritsugu (A.). **Studies on the Top-borer of Sugar-cane in Formosa.** [*In Japanese.*]—*Rep. Dept. Agric. Govt. Res. Inst. Formosa*, no. 50, pp. 1–56, 3 pls. Taihoku, 1931.

Scirpophaga nivella, F., is widely distributed in Formosa and caused serious damage to sugar-cane in 1920–23, 65·6 per cent. being attacked in one field in 1921. Injury has been considerably reduced recently, however, since the cultivation of resistant varieties of cane introduced from Java. The larvae also feed on *Miscanthus sinensis*, *Imperata cylindrica*, *Phragmites longivalvis*, *Ischaemum rugosum* and *Typha capensis*, being most common on *M. sinensis*, though the adults that emerge from it are smaller than those from sugar-cane. There are 4 or 5 generations a year in the southern part of Formosa, and all stages are found throughout the year. The adults are not attracted to light. The eggs are laid at night in masses, usually on the lower parts of the middle of the leaves in the course of 2 or 3 days, hatching in 7–23 days at 24–26° C. [75·2–78·8° F.]. The larvae bore into the leaves and then the stalks, maturing in 31–98 days. The pupae are found near the upper ends of the mines, and the pupal stage lasts 6–39 days.

Phanurus beneficiens var. *elongatus*, Ishida, is parasitic in the eggs, killing from 12–70 per cent. of those of the first generation. The males are much less common than the females. The larvae are parasitised by *Stenobracon maculata*, Mats., the rate of parasitism being usually about 1 per cent., though occasionally it may be as high as 44, *Microbracon* (*Bracon*) spp., *Exetastes longicornis*, Ishida, and *Elasmus* sp. ; and some larvae are killed by a fungus. No parasites of the pupae have been found in Formosa. The collection of the eggs, and the removal of infested canes and wild food-plants are recommended for control.

KAMIYA (K.). **On the Control of** *Dendrolimus spectabilis*, **Butl., by its Parasite,** *Apanteles fulvipes*, **Hal.** [*In Japanese.*]—*Rep. For. Expt. Sta. Korea*, no. 12, reprint 6 pp. Keijo, Korea, 1931.

Near Tokyo, *Apanteles fulvipes*, Hal., all stages of which are described, was observed to emerge from hibernating larvae of *Dendrolimus spectabilis*, Butl., in April and from *Porthetria* (*Lymantria*) *dispar*, L., in late May and early June and again from the middle of June to July. This parasite has not been found in Korea, and its introduction is recommended as *Dendrolimus* is very destructive to pines there. The adults pair soon after emergence, and oviposition occurs 2 or 3 days later, the males living 7–10 days and the females 10–20. The eggs are usually laid on the sides of the host larvae ; 1–40 parasites, with an average of 15, develop in a single host. The mature larvae bore their way out of the host and pupate after 2 or 3 days, the pupal stage lasting 17–24 days in April and 7–10 in May.

KANBE (T.). **Notes on some Hymenopterous Parasites of the Pink Bollworm.** [*In Japanese.*]—*Ann. Agric. Expt. Sta. Korea*, v, no. 4, pp. 197–222. Suigen, Korea, 1931. (With a Summary in English.)

Seven species of Hymenoptera are parasitic on the pink bollworm [*Platyedra gossypiella*, Saund.] in Korea. *Pristomerus vulnerator*, Panz., has two generations a year, the adults appearing in the middle of May and again in early August. *Microbracon* sp., which is one of the most effective parasites, has three generations a year. The rate of parasitism is over 5·6 per cent. ; it is higher on native cotton than on upland cotton, the maximum observed being 41 per cent. The female lays 2–11 eggs a day, usually 2 on each host, and from 40–50 during life. The larvae hatch in 24 hours and mature in 7–8 days. *Habrocytus* sp., which is another important parasite, has 6 generations a year, and about 70 per cent. of the hibernating host larvae were found to be killed by it. Another species of *Microbracon*, *Chelonella* sp., *Dibrachys cavus*, Wlk., and *Eurytoma* sp. are also parasitic in the larvae. Parasites in Japan are *P. vulnerator* and *Pimpla* sp.

MURAMATSU (S.). **Three very injurious Insects in the High Land Region in Korea.** [*In Japanese.*]—*Ann. Agric. Expt. Sta. Korea*, v, no. 4, pp. 255–263, 3 figs. Suigen, Korea, 1931.

The insects discussed are *Lema tristis*, Hbst. (*flavipes*, Suffr.) on rice, *Pyrausta nubilalis*, Hb., on maize and other graminaceous plants, and *Epilachna niponica*, Lew., on potato, egg-plant and tomato.

WATANABE (F.). **On *Sipalus hypocrita* Boheman.** [*In Japanese.*]—*Insect Wld.*, xxxv, pp. 190–195. Gifu, 1931.

The weevil, *Sipalus hypocrita*, Boh., attacks willow, chestnut (*Castanea*), oak, elm and other trees in Japan. The adults emerge from late May until early October, and the eggs are laid singly in the bark of the food-plant. The larvae bore into the trees, where they hibernate, the pupal stage lasting 10–17 days. They are often destroyed by woodpeckers. Felling the infested trees and removing the logs in early summer are recommended for control.

TAKAHASHI (R.). **Aphididae of Formosa. Part 6.**—*Rep. Dept. Agric. Govt. Res. Inst. Formosa*, no. 53, 127 pp., 1 diag., 1 fig., 18 pp. refs. Taihoku, Formosa, May 1931.

This is the concluding part of a series [*R.A.E.*, A, xv, 173]. Brief sections are devoted to the economic aspects of Formosan Aphids, with notes on their phylogeny and a revised food-plant catalogue. The bulk of the work consists of a systematic review of all the species, comprising some 200, with keys. Two new genera and five new species are described.

SASAKI (C.). **Studies on *Urosema mori* n. sp. and *Trichomomyia maculata* n. sp. injurious to Mulberry.** [*In Japanese.*]—24 pp., 9 figs. Tokyo, Kogaku-Kwai, 1931.

Descriptions are given of all the stages of *Urosema mori*, sp. n., and *Trichomomyia maculata*, sp. n. (which may, however, prove to be a synonym of *Diplosis mori*, Yokoyama). These Cecidomyiids injure the young buds of mulberry in Japan, much retarding their growth. There are three generations a year, the adults appearing in May, July and August and September. The eggs are laid singly on the young buds on fine days. Hibernation takes place in the larval stage in the soil or among fallen leaves. Collecting the infested buds from June to September and burning the fallen leaves are recommended for control.

Pink Boll Worm (*Pectinophora gossypiella*).—*Rep. Agric. Dept. Montserrat 1927–29*, pp. 19–20, 2 graphs. Trinidad, 1930.

A considerable degree of success in the control of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., has been obtained in Montserrat, owing to early cleaning up and planting combined with the strict observance of the close season. The results of investigation work in 1927 and 1928 support the evidence of former years that 100 per cent. infestation only obtains towards the end of the cotton season, when practically all the first crop from the early fields has been harvested. During 1928, the first crop was harvested by 10th August when the infestation was only 16 per cent. By 7th September it had risen to 73 per cent. on the second crop.

RICCHELLO (A.). **I diversi tipi di Melasso negli esperimenti di attrazione per il** *"Dacus"* **eseguiti in Ascea (Salerno) nel 1930.** [The various Types of Molasses Baits used in Experiments in attracting the Olive Fly in Ascea, Salerno, in 1930.]—*Ann. R. Inst. sup. agrar. Portici*, (3) iii, pp. 283–301. Portici, 1931.

Experiments with poison baits against *Dacus oleae*, Gmel. [*R.A.E.*, A, xviii, 368] were continued in 1930, a number of new formulae being tested. The best was a commercial stock solution (Dachicida F), which contains 2 parts by weight of water, 2 of ammonium fluoride, and 100 of the following normal stock bait-mixture: 95 gals. beet molasses, 25 lb. sodium arsenite and 2½–3 gals. water. It is used in a 10 per cent. solution, and, from counts of the number of dead flies, appeared to be about five times as attractive as a 10 per cent. solution of the normal stock mixture. Loss by evaporation should be made up with a solution of caustic soda (4–5 per cent. for the first two or three times and 2 per cent. subsequently) to keep the bait alkaline. Another product, containing beet molasses from which the sugar had been removed, appeared to be a little less attractive than the normal bait. Before concluding that the greater effectiveness of the formula containing ammonium fluoride is due to the presence of the latter, it is necessary to ascertain if the real cause does not lie in some quality of the molasses, differences in individual samples of which appear to result from the complicated process of sugar manufacture.

VAN DER VECHT (J.). **De stand van het onderzoek der peper-insecten van Nederlandsch-Indië.** [Investigations on Pepper Pests in the Netherlands Indies.]—*Landbouw*, vi, no. 8, pp. 820–828, 7 refs. Buitenzorg, February 1931. (With a Summary in English.)

This is a preliminary report on the more important pests of pepper [*Piper*] in the Netherlands Indies. The smaller pepper weevil, *Lophobaris piperis*, Mshll., is found wherever pepper is grown. The larvae mine the branches, and the adults feed on the flowers and fruits. The larger pepper weevil, *L. serratipes*, Mshll., has similar habits, but does not seem important as the larvae usually infest diseased plants. The Coreid, *Dasynus piperis*, China, attacks the older pepper fruits in Banka, Sumatra and Borneo, causing them to fall prematurely, and in Sumatra and Borneo the Tingid, *Elasmognathus hewitti*, Dist., causes similar damage to the flowers and young fruits. The insects observed in Banka include: the Limacodid, *Parasa darma*, Moore, the Geometrid, *Borbacha pardaria*, Guén., and the adults of *Lachnosterna* (*Holotrichia*) *bidentata*, Burm., on the leaves; and *Cydia* (*Laspeyresia*) *hemidoxa*, Meyr., on the new shoots of young plants.

LEEFMANS (S.). **De snuitkeverlarf in theebladeren** (*Eugnamptus hirsutus* **Voss.**). [The Weevil Larva in Tea Leaves.]—*Arch. Theecultuur Ned.-Ind.*, 1931, no. 1, pp. 5–7. Buitenzorg, February 1931. (With a Summary in English.)

The Curculionid the larva of which mines the leaves of tea in Sumatra [*R.A.E.*, A, xviii, 653] has been identified as *Eugnamptus hirsutus*, Voss. Another species, *E. marginatus*, Pasc., causes similar injury to mango in India.

DE JONG (J. K.). **Enkele proeven met paradichloorbenzol ter bestrijding van den Albizzia-boorder,** *Xystrocera festiva* **Pascoe.** [Some Experiments with Paradichlorobenzene against the Albizzia Borer, *X. festiva.*]—*Arch. Theecultuur Ned.-Ind.*, 1931, no. 1, pp. 8–16, 4 figs., 10 refs. Buitenzorg, February 1931. (With a Summary in English.)

The larvae of the Cerambycid, *Xystrocera festiva*, Thoms., bore in the cambium and youngest wood of *Albizzia* used as shade for tea in the Netherlands Indies, and so interrupt the flow of sap. The exit holes for the adults are bored by the larvae prior to pupation and weaken the stem, besides affording an entrance to various diseases. The injury done is sufficiently serious to require measures for control. It has been found that a solution of 1 part paradichlorobenzene in 10 parts kerosene kills all the larvae if applied to the bark. Only the infested part of the stem should be treated, as the cambium of younger trees is destroyed. The callus growth is, however, very marked and compensates for the killing of the cambium. The bark should be drenched with the solution applied with a sprayer having an ordinary nozzle, and not one giving a very fine spray.

DE JONG (J. K.). *Cantheconidea furcellata* **Wolff als natuurlijke vijand van rupsen in theetuinen.** [*C. furcellata* as a natural Enemy of Caterpillars in Tea Plantations.]—*Arch. Theecultuur Ned.-Ind.*, 1931, no. 1, pp. 17–24, 4 figs., 20 refs. Buitenzorg, February 1931. (With a Summary in English.)

Records of Pentatomids of the genus *Cantheconidea* preying on Lepidopterous pests in India and the Netherlands Indies are reviewed. *C. furcellata*, Wolff, all stages of which are briefly described, attacks *Setora nitens*, Wlk., and other caterpillars infesting tea in Java and Sumatra. The complete life-cycle requires about 28 days at Buitenzorg, with an egg stage of 7 days. The eggs are laid on the leaves or small branches.

JACQUES (C.). **Le figuier de Barbarie.**—*Rev. agric. Nouvelle-Calédonie*, 1931, pp. 379–383. Nouméa, April 1931.

As species of *Opuntia*, particularly *O. stricta*, are spreading in New Caledonia and threaten to become a serious problem, a consignment of *Cactoblastis* [*cactorum*, Berg.] is being obtained from Queensland with a view to their biological control.

CHRYSTAL (R. N.) & SKINNER (E. R.). **Studies in the Biology of** *Xylonomus brachylabris* **Kr., and** *X. irrigator* **F., Parasites of the Larch Longhorn Beetle,** *Tetropium gabrieli* **Weise.**—*Forestry*, v, no. 1, pp. 21–33, 2 pls., 9 refs. London, June 1931.

An account is given of observations on the Ichneumonids, *Xylonomus brachylabris*, Kriechb., and *X. irrigator*, F., which were observed in 1928 parasitising the larvae of *Tetropium gabrieli*, Weise, in larch in Suffolk and Berkshire. All stages of *X. brachylabris* are described, with notes on pairing and oviposition. The flight period usually begins about the latter half of May, emergence reaching a maximum during August and continuing until about the middle of October.

The males appear first. The adults shelter under the scales of the bark in dull and rainy weather. The eggs are laid through the bark on the dorsal surface of the body of the host larva, which is probably paralysed at the same time, though no direct evidence has been obtained on this point. One case of parthenogenesis has been observed. The egg stage lasts a little over a week and the larval stage 3–4 weeks, during which time the host is almost completely consumed. The larva then makes a cocoon in the tunnel of the host. Most of the larvae have spun their cocoons towards the end of October and remain in them until the early summer of the following year. On two occasions pupae of *X. brachylabris* were found to be parasitised by the Eupelmid, *Calosota anguinalis*, Ruschka, which is of very rare occurrence and has not previously been known as a hyperparasite.

The bionomics of *X. irrigator* are almost identical with those of *X. brachylabris*, but the adults do not emerge before July, though maximum flight occurs at the same time in both species. Experimentally neither species parasitised Longicorns other than *Tetropium*. Notes are given on the morphology of the head of the last stage larva of both parasites.

SMITH (H. D.). **Description of a new Species of Ichneumon-fly parasitic on *Pyrausta nubilalis* Hbn. in Europe.**—*Boll. Lab. Zool. Portici*, xxv, pp. 257–258, 1 fig., 2 refs. Portici, 20th July 1931.

Both sexes of *Omorgus* (*Campoplex*) *pyraustae*, sp. n., are described from cocoons attached to larval skins of *Pyrausta nubilalis*, Hb., in France. This Ichneumonid was first reared in 1927, and in 1929 was misidentified as *O.* (*C.*) *lugubrinus*, Hlgr. [*R.A.E.*, A, xviii, 726].

SOURSAC (L.). **La chenille fileuse du pommier.**—*Prog. agric. vitic.*, xciv, no. 27, pp. 21–22. Montpellier, 5th July 1931.

In view of the presence of several centres of infestation by *Hyponomeuta malinellus*, Zell., on apple trees in the Pyrenees region of the South of France, a kerosene-soap emulsion containing 3 per cent. actual oil spray is recommended against the larvae in their nests. It should be applied with a high pressure sprayer, otherwise it is essential to tear the nests before spraying. Two or three applications should be made, in the evening, at an interval of a few days.

PUSSARD (R.). **A propos de *Laspeyresia* (*Carpocapsa*) *pomonella* L.**—*Rev. Path. vég. Ent. agric.*, xviii, pt. 3–4, pp. 87–104, 1 pl., 22 refs. Paris, March–April 1931.

In view of the attention now being directed in the Rhône Valley to the question of combining insecticides with the fungicides used on fruit trees, particularly those attacked by *Cydia* (*Laspeyresia*) *pomonella*, L., work done on the bionomics and control of this moth on various food-plants in different parts of the world is reviewed. It has been found in England that in a season when fruit is scarce some of the larvae may live exclusively on foliage, and the author has observed them mining in pear shoots. He has also found that larvae hibernating on walnut trees entered pupation later than those in the same locality on pears. In 1929–30, about 70 per cent. of the hibernating larvae were killed by

the fungus *Beauveria*. Only a single individual of the Ichneumonid, *Trichomma enecator*, Rossi, was obtained from the larvae, but a Tachinid parasite, *Arrhinomyia* (*Elodia*) *tragica*, Mg., was fairly common in one locality. For trap-bands, corrugated cardboard is better than sacking, and numbers of larvae were found in the corrugations, some of them associated with *Forficula auricularia*, L., which was probably predacious on them. Walnut trees treated with a spray programme that included three applications of 5 lb. calcium arsenate and 1 lb. casein in 100 gals. Bordeaux mixture, on 16th June and 1st and 16th July respectively, showed only 20 per cent. infestation as compared with about 80 per cent. on untreated trees.

[Vukasović (P.)] Voukassovitch (P.). **Action des huiles sur la cochenille** *Lecanium corni* **L.**—*Rev. Path. vég. Ent. agric.*, xviii, pt. 3–4, pp. 104–109. Paris, March–April 1931.

In recent years *Lecanium corni*, Bch., has become a serious pest of plums in Jugoslavia ; in Serbia about half the plum orchards have been ruined. The insecticides used against it [*R.A.E.*, A, xviii, 234, 432] are all very expensive, sometimes costing as much as a third of the total value of the crop. The author therefore experimented with a number of mineral and vegetable oils for winter treatments against the hibernating larvae, of which the best was a cheap lubricating oil (specific gravity 0·920–0·925 ; viscosity 6–6·5° Engler at 20° C. [68° F.], 2–2·2° at 50° C. and 1·20–1·25° at 100° C.). A 0·5 per cent. emulsion of this oil killed 98–100 per cent. of the larvae on small pieces of plum branches plunged into the emulsion. When 1 or 2 per cent. emulsions were used, 100 per cent. mortality always resulted. Preliminary experiments in the field have also given very good results. To prepare the emulsion wheat flour (20 oz. to each pint of oil) is poured into the oil which is stirred all the time in order to obtain a homogeneous mass. The necessary quantity of water is then gradually added and emulsified. The emulsion remains effective for several days, in spite of a certain precipitation of the flour, though it is advisable to prepare it fresh for use. It has very good wetting properties, penetrating between the larvae and the bark and blocking the spiracles. It is not, however, effective in spring when the larvae become active, particularly after the second moult.

Balachowsky (A.). **Sur la valeur insecticide des émulsions d'huiles végétales dans la lutte contre les aphidiens nuisibles aux cultures.**—*C.R. Acad. Agric. Fr.*, xvii, no. 20, pp. 676–682, 5 refs. Paris, 1931.

Studies of vegetable oils, which although chemically very different from white oils previously studied [*R.A.E.*, A, xix, 249] are similar to them in regard to density and viscosity, showed that olive oil of inferior quality and ground-nut oil are both highly effective in the control of Aphids, and the cost is very low. In most cases, complete mortality was secured by a ½ per cent. concentration of oil, but for certain resistant species, such as *Eriosoma lanigerum*, Hausm., the concentration had to be raised to 1 per cent. The most satisfactory formula is 15 lb. white soap, ½ gal. oil and 100 gals. water. The soap is

dissolved in 7 gals. water, boiled for 10 minutes and allowed to cool. The oil is then gently poured into the solution and the whole emulsified and finally diluted to 100 gals. Soft water should be used to avoid precipitation of the soap. Total mortality of Aphids is only secured with a high power sprayer, death usually occurring in 15–30 minutes. Serious scorching of plants results from the use of the oils at concentrations above 3 per cent., but with 1 per cent. strength there is no danger even to the most sensitive ones. Applications are better made in the evening, particularly if the sun is hot during the day. Pot plants should be placed horizontally during treatment, to avoid the danger of the oil running down into the pots and affecting the roots.

CARLOTTI (J.). **Essai de lutte contre la mouche de l'olive en Corse en 1929.**—*Prog. agric. vitic.*, xcv, no. 24, pp. 566–570. Montpellier, 14th June 1931.

During recent years, the olive fly [*Dacus oleae*, Gmel.] has been so destructive in Corsica that the olive crop has been largely and sometimes totally destroyed, and in some villages where olives were the principal source of revenue their cultivation has been almost abandoned. An experimental demonstration campaign was therefore started, each tree in a selected area being sprayed with about 1 qt. of a mixture of 50 lb. molasses, 1 lb. sodium arsenate and 50 gals. water. Three applications were made, the third about 20th September. Until the beginning of November the trees in the middle of the treated area had all their fruit intact, and those towards the outside of the area were almost free of infestation, whereas untreated trees had scarcely any fruit at all. During November, however, re-infestation by the fly occurred, and in December the attack was severe. Even in these circumstances, one-quarter of the crop was saved, and the expenditure was covered by the value of the additional fruit.

MARTELLI (G. M.). **Contributo alla conoscenza dell'** *Aporia crataegi* **L. e di alcuni suoi parassiti ed epiparassiti.** [A Contribution to the Knowledge of *A. crataegi* and of some of its Parasites and Hyperparasites.]—*Boll. Lab. Zool. Portici*, xxv, pp. 171–241, 14 figs. 3 pp. refs. Portici, April 1931.

A detailed account is given of the bionomics of *Aporia crataegi*, L., based on observations at Foggia and Portici. It has one generation a year, the egg stage occupying 15–16 days, the larval 306–325 (the third, hibernating, instar requires 270–285), the prepupal 2–2½, and the pupal 18–20. Though common in Italy, where it occurs on pear, apple, plum, cherry, apricot, and other plants, a list of which is given, it has never caused serious injury, its chief food-plant being the wild pear. In 1930 its numbers were considerably reduced by a polyhedral disease that appeared in 1928.

Notes are given on the bionomics of the parasites observed by the author which include *Apanteles difficilis*, Nees, *Pimpla instigator*, F., *A. spurius*, Wesm., *Brachymeria scirropoda*, Först., *Tricholyga segregata*, Rond., *A. glomeratus*, L., and *Pteromalus puparum*, L.

HESSE (E.). **Insektenfrass an *Lilium martagon* L.** [Insects feeding on *L. martagon*.]—*Z. wiss. InsektBiol.*, xxvi, no. 2–3, pp. 77–79. Berlin, May 1931.

In addition to most of the pests already noticed [*R.A.E.*, A, xviii, 696], the Noctuid, *Orrhodia erythrocephala* var. *glabra*, Hb., is recorded as attacking *Lilium martagon* in Brandenburg.

BÖNING (K.). **Krankheiten, Schädlinge und Witterungsschäden am Tabak im Jahre 1930.** [Diseases, Pests and Weather Injury to Tobacco in Bavaria in 1930.]—*Prakt. Bl. PflBau u. PflSchutz*, ix, no. 3, pp. 56–60. Freising, June 1931.

The insect pests of tobacco recorded include wireworms, which attacked young plants, and the Tortricid, *Cnephasia wahlbomiana*, L., which also occurred on clover and lucerne.

SCHNAUER (W.). **Untersuchungen über *Tipula*-Schäden auf den Grünlandflächen im Havelländischen und Rhin-Luch.** [Investigations on Injury by Tipulids in the Grünland Areas of the Havelland and Rhin-Luch Districts, Brandenburg.]—*Arb. LandwKamm., Brandenburg u. Berlin*, 1931, no. 77. (Abstract in *NachrBl. deuts. PflSchutzDienst*, xi, no. 5, p. 37. Berlin, May 1931.)

From 1924 to 1928 considerable harm was done in Brandenburg by Tipulids, particularly *Tipula paludosa*, Mg., other species involved being *Pachyrrhina pratensis*, L., and *P. maculata*, Mg. Excessive rainfall in September results in an extension of attack [*R.A.E.*, A, xix, 127].

ECKSTEIN (F.). **Ueber Immunität bei Insekten.**—*Anz. Schädlingsk.*, vii, no. 5, pp. 49–55, 13 figs. Berlin, May 1931.

A brief account is given of the defensive reactions of insects to foreign bodies, animate or inanimate, that may enter them. In the simplest reaction, the body is received into the lymphocytes, where it is decomposed and rendered harmless. Another reaction is the encysting of the intruding body, as exemplified in larvae of *Acantholyda* (*Lyda*) *stellata*, Christ, attacked by Tachinids [*R.A.E.*, A, x, 559]. Cysts are formed round silk and cotton fibres threaded through larvae of *Galleria mellonella*, L., *Calliphora vomitoria*, L., *Tipula oleracea*, L., and *T. paludosa*, Mg. The chemistry of the reactions between the defensive ferments produced by Tipulid larvae infested by a Tachinid parasite and the anti-ferments developed by the latter is discussed.

[ZVEREZOMB-ZUBOVSKIĬ (E. V.).] **Зверезомб-Зубовский (Е. В.). On the Periodical Appearance of the Meadow Moth and some of its other Peculiarities.**—*The Meadow Moth in 1929–1930* [*In Russian*], pt. 1, pp. 3–8, 1 map, 51 refs. Kiev, Izd. Ukr. nauchno-issled. Inst. sakharn. Promuishl., 1931.

The author disagrees with the view that *Loxostege sticticalis*, L. (meadow moth) appears in numbers every seven years and does not occur in the same district for two consecutive years. From records in

various parts of the Russian Union it is impossible to trace any periodicity in its occurrence, and little if anything is known of the factors that govern its outbreaks. The behaviour of the larvae and adults in different years, as observed in the Kiev Government, is briefly discussed from the literature as well as the possibility of the occurrence of the moth in the same district for two or more consecutive years. The distribution of the different generations in the chief beet growing regions of European Russia in 1929 is shown on a map.

[KORAB (I. I.).] **Кораб (И. И.). Some Observations on the Meadow Moth in 1929.** *Loxostege sticticalis* **L.**—*The Meadow Moth in 1929–1930* [*In Russian*], pt. 1, pp. 9–42, 17 figs., 3 refs. Kiev, Izd. Ukr. nauchno-issled. Inst. sakharn. Promuishl., 1931.

Previous investigations have shown that in European Russia permanent foci of *Loxostege sticticalis*, L., occur in the south-west, and the author suggests that its sudden appearance in other regions is due to distribution by wind. This view is confirmed by data from the literature and diagrams showing the direction of the wind in 1929. Observations in that year in the Kiev Government showed that only a few eggs are laid on the leaves of the more advanced beet and weeds, the vast majority being deposited on very young shoots, débris and the soil, this being probably partly due to the tendency of the moths to oviposit in places not exposed to the wind. The adults of the first generation, which occurred from 9th till 27th July, laid the largest number of eggs, almost all the females of the second, which were on the wing about 20th August, being sterile, probably owing to insufficient nourishment, as a result of the scarcity of flowers at which the moths feed. Of moths caught in the field and fed on solutions of sugar or honey, 58 per cent. recovered the power of oviposition. Adults deprived of food and water lived nine days.

In experiments, a fairly high degree of control was obtained by covering the eggs on the ground with soil. Sprays of soft soap, 1 : 400, or 3 per cent. tobacco extract, 1 : 10, killed all the eggs, but are too expensive for general use. The widely used practice of ploughing to destroy the larvae is not effective, as when fourth instar larvae were covered with 4 ins. of soil 60 per cent. of the resulting adults reached the surface. Descriptions are given of two horse-drawn dusters and of a large net mounted on wheels and pushed by a horse for catching the adult moths.

[LEBEDYANSKAYA (M.).] **Лебедянская (М.). The Meadow Moth in 1929 according to Observations at the Ramon Plant-breeding and Experiment Station.**—*The Meadow Moth in 1929–1930* [*In Russian*], pt. 1, pp. 43–60, 3 graphs. Kiev, Izd. Ukr. nauchno-issled. Inst. sakharn. Promuishl., 1931.

An account is given of the seasonal occurrence of the three generations of *Loxostege sticticalis*, L., in the Ramon district of the Voronezh Government, with lists of the flowers at which the moths fed, and the plants on which they oviposited. Eggs were usually deposited on the lower surface of the leaves, with a preference for young shoots and places where the vegetation was not dense. The character of the

damage caused to various plants, the dependence of larval feeding on temperature and the migration of the larvae are discussed. On an average, 25 per cent. of those of the second generation were attacked by parasites of which the following were reared in the laboratory: the Tachinids, *Tachina* (*Eutachina*) *erucarum*, Rond., and *Zenillia pullata*, Mg. (*Tritochaeta polleniella*, Rond.), the Braconids, *Cardiochiles saltator*, Nees, *Orgilus obscurator*, Nees, *Zele testaceator*, Curt., and two species of *Apanteles*, and the Ichneumonids, *Cryptus viduatorius*, F., *C. disjunctus*, Tosq., *Eulimneria rufifemur*, Thoms., and *E. xanthostoma*, Grav. Of the larvae collected in one locality, 36 per cent. were killed in their cocoons by a bacterial disease. In the field the larvae were preyed upon by those of *Melanotus brunnipes*, Germ., *Calosoma investigator*, Ill., and *Chrysopa perla*, L., and rooks fed readily on the pupae.

Bonfires were of little value for attracting the moths, as they soon became accustomed to the light and did not react to it. A considerable number were caught by a trap consisting of a powerful light and an electric fan which blew them through a funnel into a tub of water, but this cannot be used on windy nights and is too expensive to be generally employed. Covering the eggs with layers of soil 1–3 cm. deep did not prevent their hatching, though the young larvae were killed. In the laboratory, 1 lb. soft soap to 3 gals. water proved an effective ovicide, and a dust of calcium arsenite and lime, 1 : 30, killed 40 per cent. of the larvae on the fourth day. Mature larvae fed on beet leaves sprayed with a 10 per cent. solution of salt all died in two days. Covering the pupae with layers of soil, 2, 4 and 6 ins. deep prevented the adults from emerging, which indicates that the practice of ploughing the fields to bury the pupae is of value.

[LYUBOMUDROV (I. S.).] **Любомудров (И. С.). The Development of the Meadow Moth in 1929 in the Podol'sk Region of the Beet Cultivation Area.** *Loxostege sticticalis* **L.**—*The Meadow Moth in 1929–1930* [*In Russian*], pt. 1, pp. 61–72. Kiev, Izd. Ukr. nauchno-issled. Inst. sakharn. Promuishl., 1931.

Brief notes are given on the occurrence of *Loxostege sticticalis*, L., in the former Podol'sk Government (south-western Ukraine) since 1925, and the times of appearance of the different stages in various districts in 1929 are discussed in detail. There were only two complete generations, the females of the second, which were on the wing in the second half of August, being sterile. The author believes this to have been due to the prevailing heat and drought, and to lack of nourishment, as a result of the scarcity of flowering plants. Moths caught in the field and kept in a cool damp environment readily oviposited and produced a third generation. In the spring, the first adults appeared in the second half of May; swarms of the moths were often carried about 2 miles by strong winds. Lists are given of the plants on which oviposition occurred and those on which the larvae fed. The first generation caused serious damage to beet in June, when the number of larvae to a plant averaged 150–200; the second generation infested clover and lucerne in the first half of August, when only about 2 per cent. of the beet was injured.

The percentage of parasitism was 0·3–1·5 per cent. in the first generation and 8–10 per cent. in the second.

[Bogolepova (L. D.).] **Боголепова (Л. Д.). Observations on the Biology of the Meadow Moth in 1929.**—*The Meadow Moth in 1929–1930* [*In Russian*], pt. 1, pp. 73–79. Kiev, Izd. Ukr. nauchno-issled. Inst. sakharn. Promuishl., 1931.

This is an account of laboratory observations in the Podol'sk Government on the development of the first and third generations of *Loxostege sticticalis*, L. At 14–15° C. [57·2–59° F.] the egg and larval stages of the first generation averaged 4·5 and 18 days, and the adults emerged about 26 days after the larvae had entered the soil for pupation. Eggs laid at the beginning of September by second generation moths collected in the field hatched in 4–10 days at a temperature varying from 9·4° C. to 16·4° C. [about 49–62° F.]. Owing to low temperature in the insectary, the development of the larvae averaged 45 days.

[Negrash (K. A.).] **Неграш (К. А.). The Oviposition of the Meadow Moth in 1929.** *Loxostege sticticalis* **L.**—*The Meadow Moth in 1929–1930* [*In Russian*], pt. 1, pp. 81–100, 8 figs. Kiev, Izd. Ukr. nauchno-issled. Inst. sakharn. Promuishl., 1931.

Observations in the eastern part of the former Kiev Government showed that *Loxostege sticticalis*, L., usually oviposits on the lower surface of leaves growing close to the ground. Eggs are laid on a great variety of wild and cultivated plants, lists of which are given, preferably on young shoots and trailing plants, irrespective of whether or not they can serve as food-plants for the larvae, and also on decaying stubble, débris and the soil. The moths of the overwintered generation occurred at the end of May and in the first half of June and oviposited in meadows, a decided preference being shown for *Convolvulus arvensis* and *Polygonum aviculare*, whereas those of the first generation, which were on the wing throughout most of July, concentrated in beet fields, so that 24·4 per cent. of the crop was destroyed by the second generation larvae as compared with 1·5 per cent. damaged in June. In the field, oviposition ceased at an average temperature of 10·6–14·4° C. [about 51–58° F.]. Owing to the heat and drought in August and the scarcity of food, the adults of the second generation, which were more abundant than those in May or July, were sterile, only a few eggs being laid in some localities.

[Ushinskiĭ (A. V.).] **Ушинский (А. В.). Some Observations on the Meadow Moth.**—*The Meadow Moth in 1929–1930* [*In Russian*], pt. 1, pp. 101–104. Kiev, Izd. Ukr. nauchno-issled. Inst. sakharn. Promuishl., 1931.

Brief notes are given on the seasonal occurrence of the three generations of *Loxostege sticticalis*, L., in a district in the south-east of the former Kiev Government, and on the habits of the adults. The eggs of the first generation were laid on weeds and lettuce, preference being shown for *Fumaria officinalis*, whereas those of the second occurred chiefly on the débris on the soil or on weeds and to some extent on beet. In certain localities 14–18 per cent. of the larvae of the second generation were parasitised by Tachinids, and others were killed by a disease. The Carabid, *Calosoma auropunctatum*, Hbst., which was common, and the larvae of *Chrysopa* sp. were predacious on those of this moth.

[Puzuirnuiĭ (R. G.).] **Пузырный (Р. Г.). The Effect of Starvation on the Metamorphosis of the Larvae of the Meadow Moth.** *Loxostege sticticalis.—The Meadow Moth in 1929–1930* [*In Russian*], pt. 1, pp. 105–110. Kiev, Izd. Ukr. nauchno-issled. Inst. sakharn. Promuishl., 1931.

The dependence of the development of insects on nourishment in the larval stage is briefly discussed from the literature, and an account is given of laboratory observations in Kharkov on the effect of starvation on the larvae of *Loxostege sticticalis*, L. The periods of survival in days for unfed larvae were 1–1½ for the first instar, 2 for the second, 3–5 for the third, 3–8 for the fourth and 7–10 for the fifth. It is important, therefore, to destroy the larvae present in the field at the time of resowing a severely damaged beet plantation, as it takes only 4–5 days for the young beet to sprout, a period that does not affect the more advanced larvae. Larvae old enough to survive fasting for 1–3 days were not retarded in development.

[Lindeman (I. V.).] **Линдеман (И. В.). The Effect of the Damage caused by the Larvae of the first and second Generations of the Meadow Moth on the Weight and Sugar Content of Sugar Beet.**—*The Meadow Moth in 1929–1930* [*In Russian*], pt. 1, pp. 111–132 Kiev, Izd. Ukr. nauchno-issled. Inst. sakharn. Promuishl., 1931.

The injury caused to sugar-beet by *Loxostege sticticalis*, L., is divided into five grades, and its effect on the weight and sugar content of the crop is discussed. Watering heavily infested plots in August, when the weather was very dry and hot and the damage caused reached 60 per cent., showed that 25 per cent. of the loss in the yield of sugar should be attributed to the effect of the drought, and only 35 per cent. to the activity of the larvae.

[Ostrovskiĭ (M. F.).] **Островский (М. Ф.). On the Damage caused to Potatoes by the Larvae of the Meadow Moth.** *Loxostege sticticalis* **L.**—*The Meadow Moth in 1929–1930* [*In Russian*], pt. 1, pp. 133–134, 1 fig. Kiev, Izd. Ukr. nauchno-issled. Inst. sakharn. Promuishl., 1931.

Injury to the stems of potato plants by *Loxostege sticticalis*, L., in August 1929 in a district of north-western Ukraine is described. Though the leaves were hardly attacked, they dried up. Early sown varieties, the stems of which had become coarse at the time of the outbreak, were not attacked, and two late varieties, which had particularly well developed stems, suffered little injury.

[Negrash (K. A.).] **Неграш (К. А.). Covering Beet with Earth to protect it from the Larvae of the Meadow Moth.** *Loxostege sticticalis* **L.**—*The Meadow Moth in 1929–1930* [*In Russian*], pt. 1, pp. 135–146, 4 figs., 1 ref. Kiev, Izd. Ukr. nauchno-issled. Inst. sakharn. Promuishl., 1931.

Field experiments in the Kiev Government at the end of July and beginning of August 1929 indicate that in the case of a severe outbreak of the second generation of *Loxostege sticticalis*, L., covering the beet plants with a layer of soil 4·5 cm. deep is effective in protecting the roots

from attack. Mature larvae soon make their way to the surface of the soil and do not re-enter it. In order to prevent their migrating to adjoining plantations, the field should be surrounded with ditches or planks placed on edge and coated with an adhesive. A layer 2·3 cm. deep is insufficient to protect the plants, as the larvae easily penetrate the roots after destroying the leaves and stems. Retarded covering with a 3 cm. layer, after many of the roots have been damaged in the uppermost part, however, prevents further infestation. Special machines for this purpose, one of which is briefly described, cover the plants effectively and save time and labour. Subsequent removal of the soil is apparently unnecessary, as the plants develop new shoots above the heaps of earth and continue to grow, especially in dry weather.

In controlling the first generation, the numbers of larvae should be reduced by hand collection or insecticides before the plants are covered with soil, as it is essential for the young plants to be uncovered after a short time.

[Luchnik (V.).] **Лучник (В.). A Note on the Beetles of the Genus** *Calosoma* **Web.**—*The Meadow Moth in 1929–1930* [*In Russian*], pt. 1, pp. 147–155, 19 refs. Kiev, Izd. Ukr. nauchno-issled. Inst. sakharn. Promuishl., 1931.

In Russia, Carabids of the genus *Calosoma* are predacious on a number of pests, including the larvae of *Loxostege sticticalis*, L. Keys are given to the Palaearctic subgenera and species, except those of the subgenus *Callisthenes*, which the author believes to be of no economic importance. The geographical distribution of each species is indicated, and brief notes on some of them are included. *C. sycophanta*, L., which is common in some parts of the Russian Union and rare in others, becomes exceedingly abundant wherever an outbreak of the gipsy moth [*Porthetria dispar*, L.] occurs, and in 1925 was probably to a great extent responsible for the marked decrease in the numbers of the latter in forests in the northern Caucasus where it infested an area of over 35,000 acres. After the disappearance of *P. dispar*, *C. sycophanta* became again scarce. *C. denticolle*, Gebl., which has been observed feeding on the larvae of *Loxostege* in the northern Caucasus, is only active at night ; the adults are strongly attracted by light.

[Anisimova (M.).] **Анисимова (М.). The Biology of a Parasite of the Meadow Moth,** *Phytodietus segmentator* **Grav.**—*The Meadow Moth in 1929–1930* [*In Russian*], pt. 1, pp. 161–170, 7 figs., 1 ref. Kiev, Izd. Ukr. nauchno-issled. Inst. sakharn. Promuishl., 1931.

An account is given of laboratory observations carried out in August 1929 in Saratov on the Ichneumonid, *Phytodietus segmentator*, Grav., an ectoparasite of *Loxostege sticticalis*, L. Development from egg to adult is completed in 32–38 days, the egg, larval and pupal stages lasting 4–5, 13–16 and 15–17 days respectively. Eggs are deposited singly between two of the first four segments of the host, and several may be laid on one larva. One female laid 33 eggs in 8 days, 39 more being found in the ovaries after dissection, and another laid 32 eggs in 11 days ; in both cases oviposition occurred every day and stopped one day before the parasite died. The egg is not removed when the host moults, as it is fixed to the latter on a stem that is embedded in the muscular layer.

The parasite larva does not completely emerge from the egg shell during its feeding period, at the end of which its last segment still remains in it. The larvae pupate in cocoons, inside those of the host.

All stages of the parasite are described.

Briand (L. J.). **Notes on *Chrysopa oculata* Say and its Relation to the Oriental Peach Moth (*Laspeyresia molesta* Busck) Infestation in 1930.**—*Canad. Ent.*, lxiii, no. 6, pp. 123–126. Orillia, Ont., June 1931.

Larvae of *Chrysopa oculata*, Say, and *C. albicornis*, Fitch, of which the former was much the more numerous, were observed in 1930 attacking the eggs of *Cydia* (*Laspeyresia*) *molesta*, Busck, on peach in Ontario, from 20 to 60 per cent. of the eggs being destroyed in various localities examined. The cause apparently was the scarcity of the usual Aphid hosts owing to the dry season. An account is given of observations on the bionomics of these Chrysopids. They destroyed a considerable number of peach moth eggs parasitised by *Trichogramma minutum*, Riley, and on the other hand the latter infested their eggs, a parasitism of 5–12 per cent. being observed on several occasions.

Watson (E. B.). **The Biology of Canadian Bark-beetles. The Seasonal History of *Dendroctonus rufipennis* Ky. in Northern Ontario.**—*Canad. Ent.*, lxiii, no. 6, pp. 126–127. Orillia, Ont., June 1931.

Dendroctonus rufipennis, Kby., which is locally distributed in the forest areas of Quebec and Ontario, has been observed breeding in fallen white and jack pines [*Pinus strobus* and *P. banksiana*], and, in recent years, also in red pine [*P. resinosa*], its presence apparently depending largely on the amount of suitable breeding material. A study of this bark beetle lasting over three years in northern Ontario showed that in favourable seasons the adults emerge towards the end of May, though there is rarely much activity before the first or second week in June. In fallen timber, the entrance is almost invariably made on the under side of the trunk, the egg-tunnels following the grain of the wood, with short food-tunnels branching from them. The eggs hatch in July and the larvae feed, hibernate, and feed again until the following July or August when they pupate in individual cells in the wood. The adults do not leave the tunnels until the following May or June, so that the life-cycle occupies two years. Attempts to breed in living trees appear to result always in failure, the beetles being overcome by the heavy flow of resin, and even in fallen trees the amount of resin is often sufficient to kill them.

Glendenning (R.). **The Lecanium Scale. An Insect affecting Fruit and Shade Trees on the Pacific Coast.**—*Circ. Dept. Agric. Canada*, no. 77, 4 pp., 5 figs. Ottawa, February 1931. [Recd. July 1931.]

A brief account is given of the bionomics of *Lecanium* (*Eulecanium*) *coryli*, L. (*capreae*, L.) in British Columbia [*R.A.E.*, A, xiv, 174] where it still continues to spread. A large number of woody plants are attacked, among those severely infested being apple, pear, plum and cherry. Instead of oil emulsions [*loc. cit*], a spray of 40 per cent. nicotine sulphate (1 : 1,000) and soap may be used for small areas. It should be applied in September and thoroughly wet the lower surface of the leaves where the young Coccids are at that time.

Downes (W.). **The Strawberry Root Weevil, with Notes on other Insects affecting Strawberries.**—*Pamph. Dept. Agric. Canada,* N.S. no. 5, revd. edn., 19 pp., 8 figs. Ottawa, March 1931.

This is a revision and largely a reprint of a previous paper on pests of strawberry in British Columbia [*R.A.E.*, A, x, 459]. The barriers previously described against the weevil, *Otiorrhynchus* (*Brachyrrhinus*) *ovatus*, L., have proved too expensive and troublesome to erect, except in special cases, and much better results have been obtained with poison baits [*cf.* xvi, 121]. To prepare the bait recommended 50 lb. raisins are soaked in 5 quarts of water for 6–12 hours ; 5 lb. sodium fluosilicate thoroughly mixed with 50 lb. shorts is then mixed with the raisins, from which the surplus water has been drained away. Before use the mixture should be slowly passed through a large-sized butcher's mincer, set to cut coarsely. The result should be a slightly moist, crumbly mass of a consistency to form a ball when squeezed in the hand. Spoiled raisins or those stored too long can be obtained cheaply for the bait. Sodium fluoride may be substituted for the fluosilicate, using 7 lb. instead of 5. Dried prunes (if the difficulty of the stones can be overcome) may be substituted for the raisins. Rotation of crops is still an important measure, but the use of poison bait allows more latitude in this respect ; certain rotations are suggested. Against *Polyphylla decemlineata*, Say, good results were obtained in poisoning the grubs by ploughing in a dry mixture of 1 lb. sodium fluosilicate to 12 lb. bran, scattering the mixture in a furrow alongside the row and then turning it under, or dropping a handful into a hole 6 ins. deep between the plants.

Wildermuth (V. L.). **Chalcid Control in Alfalfa-seed Production.**—*Fmrs'. Bull. U.S. Dept. Agric.*, no. 1642, 14 pp., 12 figs. Washington, D.C., May 1931.

This is a revision of a previous bulletin [*R.A.E.*, A, iii, 185] and gives an account of the bionomics of the Eurytomid, *Bruchophagus funebris*, How. (clover-seed Chalcid), which is one of the most serious factors in reducing the crop of lucerne seed in many parts of the United States. The seasonal history differs greatly according to the locality and climate. The cultural methods practised to reduce attack by the Chalcid are discussed [*cf.* also viii, 361].

Hadjinicolaou (J.). **Effect of certain Radio Waves on Insects affecting certain Stored Products.**— *J. N.Y. Ent. Soc.*, xxxix, no. 2, pp. 145–150, 2 refs. New York, N.Y., June 1931.

Studies carried out on the basis of data obtained by Headlee [*R.A.E.*, A, xix, 486] showed that various insects affecting stored products, when subjected to high frequency radio waves, are killed owing to their internal temperature reaching a lethal point. Larvae of *Plodia interpunctella*, Hb., in dried fruits, and larvae and pupae of *Sitodrepa panicea*, L., in ground pepper were killed when subjected to these waves at the rate of 1,090,000 cycles per second with a field strength of 3977·16 volts per inch for 2–2½ minutes. All stages of *Bruchus quadrimaculatus*, F., were killed when the beans infested by them were subjected to a frequency of 1,087,000 cycles per second for 5 minutes with a strength of field of 4,000 volts per inch. Various pulses gave 100 per cent. germination after treatment for 45 minutes or more.

PIERCE (W. D.). **The Bearing of the Oxytofactor in Insect Control.**—*J. N.Y. Ent. Soc.*, xxxix, no. 2, pp. 159–165. New York, N.Y., June 1931.

The author discusses in relation to insect control the effect upon living organisms of the factor acidity—alkalinity, which he expresses as the oxytofactor, in the media in which they live. An organism is killed if subjected to acidity or alkalinity outside a definite range of oxytofactors, its death being brought about by the oxyto reaction (interchange between two bodies differently electronically charged). As the range of oxytofactors favourable to a given insect and to the plant it attacks are usually not the same, control may be effected by altering the existing range in the direction favourable to the plant, which may be either towards acidity or towards alkalinity in individual cases. The proper control measures are frequently the reconditioning of the environment of the plant to enable it to accomplish the destruction of the insect. This theory has been put into effect in the control of a white grub in Negros (Philippines), where it is the dominant soil pest of sugar-cane. The larvae were only present in soils that had an acid reaction, and their pH was usually a little more acid than that of the soil. A heavy dressing of lime, bringing the soil condition toward that most suitable for the sugar-cane (pH 7), was sufficient to effect control of the grubs, which were not found in Negros in soils with a pH above 6·8.

SATTERTHWAIT (A. F.). *Anaphoidea calendrae* **Gahan, a Mymarid Parasite of Eggs of Weevils of the Genus** *Calendra*.—*J. N. Y. Ent. Soc.*, xxxix, no. 2, pp. 171–190, 2 figs., 1 ref. New York, N.Y., June 1931.

The Mymarid, *Anaphoidea calendrae*, Gahan, the immature stages of which are described, parasitises the eggs of several species of *Sphenophorus* (*Calendra*), especially *S. minimus*, Hart, *S. parvulus*, Gyll., and *S. callosus*, Ol., all of these weevils being very destructive to maize, small grains and grasses. It has been taken in Mississippi, Missouri and New Jersey, and probably occurs throughout the range of its hosts in the eastern half of the United States. Reference is made to its attempted introduction into Hawaii against *Rhabdocnemis obscura*, Boisd. [*R.A.E.*, A, xviii, 588].

Rearings from eggs of *S. minimus* naturally or artificially parasitised show that the most usual number of adults to develop in one host is 7, the commonest sex ratio being 1 male to 6 females. Records of parasitism of larger species of *Sphenophorus* indicate that the sex ratio remains unchanged, and that more than the normal number of eggs are deposited in some large host eggs. Rearings from the latitude of St. Louis, Missouri, including the issuance of 35 groups, indicate that there are at least 4 generations annually, and sometimes probably 7. The first parasites were found in an egg collected on 5th June, and if they belonged to the first brood, it may be assumed that adults of the hibernating and 6 subsequent broods issue about 3rd June, 19th June, 3rd July, 16th July, 30th July, 15th August, and 1st September, respectively, and that suspension of development of larvae occurs in an indeterminate proportion of the fourth, fifth, sixth and seventh broods, but chiefly in the sixth. The bulk of the adults from the hibernating brood would probably issue in any given locality within a period of 10

days. Each group should live in the adult state for 3 or more days and oviposit throughout that time. The duration of the life-cycle of individual groups lasts 13–18 days with *S. destructor*, Chitt., as host, 14–18 with *S. parvulus*, and 14–26 with *S. costipennis*, Horn. Records are given of the length of time taken by *A. calendrae* to develop in the summer broods of 6 different species of *Sphenophorus*. Out of 29 groups an average of 16·6 days was required between the issuance of the parent and progeny adults. Development in eggs of *S. destructor* occurred more quickly than in those of *S. callosus*, as shown by groups of common parentage and date.

Descriptions are given of the behaviour of the adults and of the methods used in propagation.

Grossman (E. F.). **Insect Enemies of the Cotton Boll Weevil.**—*Florida Ent.*, xv, no. 1, pp. 8–10, 2 refs. Gainesville, Fla., April 1931.

Investigations in cotton fields in Florida, Georgia and Alabama, to determine the abundance of insect enemies of *Anthonomus grandis*, Boh., show that the total number of parasites that emerged from 8,451 bolls collected in 1927 was 387, as against 47 from 11,559 bolls collected in 1930. The percentages of squares infested by the weevil during the two years were 29 and 13·9 respectively, the yield of the crop, however, being practically the same in both years and ranging from ¼ to ¾ bales to the acre.

Figures for each of the localities inspected are shown in tables.

Grossman (E. F.). **Winter Survival of immature Stages of the Boll Weevil.**—*Florida Ent.*, xv, no. 1, pp. 13–14, 2 refs. Gainesville, Fla., April 1931.

Field and laboratory investigations in 1927 and 1928 indicate that in Florida the larvae of *Anthonomus grandis*, Boh., in cotton squares and bolls probably fail to develop into adults during the winter months, and though individuals in the late pupal stage in squares and bolls may do so, the toughness of the overwintered bolls generally tends to prevent their emergence. Abandoned cotton stalks should, however, be destroyed early in the autumn, as they provide favourable hibernation quarters for the adult weevils.

DeLong (D. M.). **Modern Buildings and the Termite Problem.**—*Ohio J. Sci.*, xxxi, no. 3, pp. 177–180. Columbus, Ohio, May 1931.

Although modifications recently introduced in building schemes against termites [*R.A.E.*, A, xviii, 114; xix, 221, etc.] will almost certainly reduce serious infestations, many modern buildings in which most of the normal precautions have been observed become infested and these infestations frequently become very severe and cause heavy losses. Subterranean species have been found to be the cause in all these cases, and explanations are given of some of the ways in which the infestations arise, on the basis of observations in Ohio. In particular, it is suggested that the trench that frequently remains exposed around the outside of foundations while the superstructure is being completed, and in which chips of wood become covered up and left when the building is finished, offers ideal conditions to termites and is a frequent source of infestation.

BRITTON (W. E.). **Connecticut State Entomologist, Thirtieth Report 1930.**—*Bull. Connecticut Agric. Expt. Sta.*, no. 327, pp. 451–582, 20 pls., 7 figs. New Haven, Conn., April 1931.

Among a large number of insect pests observed in Connecticut during 1930, the following are of particular interest : *Phobetron pithecium*, S. & A., and *Ithycerus noveboracensis*, Forst., on apple ; *Cecidomyia viticola*, O. S., *Pelidnota punctata*, L., and *Antispila viticordifoliella*, Clem., on vines ; *Elaphidion* (*Hypermallus*) *villosum*, F., on oak and red maple [*Acer rubrum*] ; *Oncideres cingulatus*, Say, on hickory in a nursery, branches being completely girdled by it (an unusual occurrence in the State) ; *Tortrix quercifoliana*, Fitch, *T. albicomana*, Clem., and *T. fervidana*, Clem., on oak ; *Diprion* (*Neodiprion*) *lecontei*, Fitch, and *Acantholyda* (*Itycorsia*) sp. on pines ; *Diaspis carueli*, Targ., on garden varieties of juniper ; and *Otiorrhynchus* (*Brachyrrhinus*) *sulcatus*, F., on yew in nurseries and ornamental plantings, the larvae feeding on the bark of the roots. Local outbreaks are recorded of *Anisota rubicunda*, F., and *Heterocampa guttivitta*, Wlk., on maples and *Pseudococcus comstocki*, Kuw., on *Catalpa*, with notes on the bionomics of the latter two. The satin moth [*Stilpnotia salicis*, L.] has been discovered in several new localities, infestations occurring chiefly on poplar. Owing to the drought, the larvae of *Anomala orientalis*, Waterh., descended several inches below the surface of the soil and did not cause injury until late in the season, except on lawns that were frequently watered and not treated with lead arsenate. The infestation of a lawn in July by *Aphodius* sp. is recorded, the larvae having eaten away the grass growing over an area of 20 sq. ft. The larvae of *Straussia longipennis*, Wied., were observed in August and October 1929, tunnelling in the stems of sunflowers. Infested stems are weakened and become broken.

The inspection of nurseries and imported nursery stock is reported on by Britton and M. P. Zappe, pests intercepted including *Aporia crataegi*, L., on pear, *Acronycta rumicis*, L., and *Calophasia lunula*, Hb., on pear and cherry, *Papilio podalirius*, L., on cherry, *Pieris brassicae*, L., on plum, and *Eurydema festivum*, L., in packing material, all from France, and *Emphytus cinctus*, L., on rose from France and Holland.

The situation with regard to the gipsy moth [*Porthetria dispar*, L.] is discussed by Britton and J. T. Ashworth. Parasites reared from small collections of larvae and pupae of the moth made during the summer were 12 individuals of *Apanteles melanoscelus*, Ratz., 15 of *Compsilura concinnata*, Mg., and 21 of *Sturmia* (*Blepharipa*) *scutellata*, R.-D., from 360 larvae, of which one batch of 100 in the first and second instars were not parasitised, and 18 of *Sturmia* from 57 pupae. In addition, 4,600 individuals of *Sturmia*, as well as 1,800 adults of the predacious beetle, *Calosoma sycophanta*, L., were liberated in various localities.

Zappe reports that *Rhagoletis pomonella*, Walsh, the bionomics of which are briefly discussed, has become unusually abundant on apple during the last few years. Orchards where spraying had ceased with the calyx spray, which in normal seasons is applied in the latter half of May, or a week after its application were the most severely infested. Spraying with lead arsenate about 1st July and again two weeks later is recommended. Notes are given by P. Garman on the rearing and distribution of parasites of *Cydia* (*Laspeyresia*) *molesta*, Busck [*cf. R.A.E.*, A, xix, 362], which has been less injurious during the season than in the previous year, and on the bionomics and control of *Empoasca*

fabae, Harr., and *Typhlocyba* (*Empoa*) *rosae*, L., on apple, based partly on the literature. Ninety-nine per cent. of the nymphs may be destroyed by treatment with a mixture of nicotine sulphate, 1 : 800, and lime-sulphur, 1 : 50, applied at the calyx period. The same author very briefly discusses factors affecting the selection of oils for use on fruit trees in Connecticut, and a chart is given showing the compatibility of various oils and fungicides.

Experiments, conducted during 1929 and 1930, on the use of mercury bichloride for controlling light infestations of cabbages by *Phorbia brassicae*, Bch., are described by R. B. Friend. The results show that although few or none of the plants may be killed by the maggots, the treatment may still give an appreciable increase in yield. Tests discussed by the same author with a number of ovicides against *Rhyacionia buoliana*, Schiff., on pine, show that the percentage of infested tips on trees treated with 2 per cent. Volck oil on 21st and 30th June was 38 as against 76 on untreated trees.

Measures for the control of the European corn borer [*Pyrausta nubilalis*, Hb.] are reported on by Britton and Zappe. During 1929 it spread in a westerly direction, and 44 new localities became infested. Britton and J. P. Johnson review the campaign against the Japanese beetle [*Popillia japonica*, Newm.], which has been found in 6 new localities in the State.

Garman reports that in 1929 *Tarsonemus latus*, Banks, continued to damage tomatos and peppers [*Capsicum*] grown in greenhouses for transplanting [*cf.* xvii, 607] even after the plants were set out in the field. Fumigating the greenhouse with naphthalene (4 lb. to 1,000 cu. ft.) killed only 75 per cent. of the mites, whereas treatment with burning sulphur during the summer when the house was empty put an end to the trouble, the temperature during the process reaching 120° F.

GARMAN (P.). **An electric Sterilizer for killing Insects in milled Cereals.**—*Bull. Connecticut Agric. Expt. Sta.*, no. 327, pp. 546–547. New Haven, Conn., April 1931.

An account is given of an apparatus for destroying insects of all stages infesting milled cereals in sealed packages by means of an electric current that will treat 45–90 fourteen-ounce cartons to the minute. It is 13 ft. long, 4·5 wide and 8·5 high, and the power consumption is between 3·5 and 5 kilowatts. In tests against the larvae of *Plodia interpunctella*, Hb., and *Lasioderma serricorne*, F., and the adults of *Tribolium confusum*, Duv., and *Silvanus surinamensis*, L., all the insects were killed by the treatment, and the packages were unharmed. The apparatus will not destroy insects infesting whole grain, or those present in packages enclosed in tin foil or metal.

NEWELL (W.), MOWRY (H.) & BARNETTE (R. M.). **The Tung-oil Tree.**—*Bull. Florida Agric. Expt. Sta.*, no. 221, 63 pp., 33 figs., 13 refs. Gainesville, Fla., October 1930. [Recd. July 1931.]

A very brief part of this paper is devoted to diseases and insect pests of the tung-oil tree (*Aleurites fordi*) in Florida. Though its native pests have not apparently accompanied the tree from China, it seems that other insects are adapting themselves to it. *Icerya purchasi*, Mask. (cottony cushion scale) was first observed on the trees in 1923. It is not considered of economic importance as it is at present readily con-

trolled on *Citrus*, etc., by the Australian Coccinellid [*Novius cardinalis*, Muls.]. However, when trees in the nursery are attacked they should be thoroughly scrubbed with a solution of fish oil soap. *Aspidiotus lataniae*, Sign., has been found in small numbers on tung-oil trees, but its economic importance is questionable. It can be easily destroyed by spraying and is frequently kept well under control by its parasites.

ELZE (D. L.). **The Relation between Insect and Virus as shown in Potato Leaf Roll, and a Classification of Viruses based on this Relation.**—*Phytopathology*, xxi, no. 6, pp. 675–686, 30 refs. Lancaster, Pa., June 1931.

The following is largely taken from the author's summary :—The literature on the significance of various insects in relation to the spread of virus diseases of potato is discussed. *Myzus persicae*, Sulz., which is particularly well adapted for spreading such diseases, has been studied especially in connection with leaf-roll. There are different opinions as to the ability of other insects to transmit the virus diseases of potato. It is suggested that such differences are due to the use of different experimental methods. European research workers generally are of opinion that *M. persicae* is the only insect that plays an important part. In experiments in Holland, which are described, on the spread of leaf-roll among potatoes of several varieties, 22 plants being exposed to each insect, *M. persicae* infected all the 22, *Aphis rhamni*, Boy., 13, *A. fabae*, Scop., 6, and *Psylliodes affinis*, Payk., 8. The slight transmitting power of the flea-beetle is ascribed to the fact that insects with cutting mouth-parts can cause infection only through virus residue that may accidentally adhere to the mouth-parts. With Aphids and other Rhynchota on the contrary, differences are explained by the assumption that the virus ingested is more or less destroyed by the organs of the insect, according to the degree of its adaptability to the latter. This assumption is supported by an experiment in which it is shown that *M. persicae* and *Macrosiphum gei*, Koch (*solanifolii*, Ashm.) do not lose their transmitting power when moulting, and that the percentage of individuals that are able to transmit the disease is nearly the same before and after the moult. Under the same conditions, the transmitting power of *Myzus persicae* was much greater than that of *Macrosiphum gei*.

On the basis of these results and those of other investigators, virus diseases of plants may be classified under three main headings, *viz.*, those that are not known to be spread by insects (*e.g.*, peach yellows) ; those that are spread by insects but are not specially adapted to individual species (*e.g.*, cucumber mosaic); and those that are adapted to particular insects. The last group may be subdivided into diseases that may in addition be transmitted mechanically by other insects (*e.g.*, potato leaf-roll) ; and those that require an incubation period in the insect vector, which may be short, as in curly-top of beet, or last 10–14 days, as in aster yellows.

BATES (M.). **Informe mensual sobre los Insectos de Guatemala.** [Monthly Report on the Insects of Guatemala.]—*Bol. Agric. y Caminos Guatemala*, x, no. 3, pp. 101–104, 3 figs. Guatemala, March 1931.

Icerya sp. is a serious pest of *Citrus* and other fruit trees in some parts of Guatemala, and it is proposed to introduce the Australian

Coccinellid [*Novius cardinalis*, Muls.] against it. Aphids recorded in Guatemala include *Aphis gossypii*, Glov., on avocado and *Eriobotrya japonica* ; *Brevicoryne brassicae*, L., on cabbage ; *Macrosiphum luteum*, Buckt., on an orchid ; and *Myzus persicae*, Sulz., and *Toxoptera aurantii*, Boy., on *Citrus*.

Aphis asclepiadis, Fitch., on *Asclepias* ; *A. gossypii* on *Hibiscus* ; and *Cerataphis lataniae*, Boisd., from a palm, *Ptychosperma* sp., are recorded in Honduras.

IXe Congrès international d'oléiculture. Tunis, Sousse, Sfax (Tunisie) du 26 octobre au 8 novembre 1928. Tome ii, 609 pp. Tunis, Direc. gén. Agric. Comm. Colon., 1929. [Recd. June 1931.]

A paper by Pagliano (pp. 274–307) deals with the insect pests of olive in Tunisia, which include *Aspidiotus hederae*, Vallot, *Lepidosaphes* (*Mytilaspis*) *flava*, Targ., *Parlatoria oleae*, Colv., *Chrysomphalus dictyospermi*, Morg., and *Aleurolobus* (*Aleurodes*) *olivinus*, Silv., all of which are minor pests ; the Psyllid, *Euphyllura olivina*, Costa, which is not very abundant but is conspicuous owing to its white, cottony secretion, and should be destroyed wherever seen ; *Saissetia* (*Lecanium*) *oleae*, Bern., of which two generations invade the trees in spring and autumn and which is destroyed to some extent by the Pteromalid, *Scutellista cyanea*, Motsch., and *Eublemma* (*Thalpochares*) *scitula*, Rmbr.; and *Liothrips* (*Phloeothrips*) *oleae*, Costa, and the moths, *Acherontia atropos*, L., *Deilephila lineata*, F., *Zeuzera pyrina*, L., *Glyphodes unionalis*, Gn., and *Prays oleellus*, F., all of which do a certain amount of damage. *Dacus oleae*, Gmel., which is discussed at some length, has a minimum of six generations annually in Tunis, but is largely held in check by the Braconid, *Opius concolor*, Szepl. Coleopterous pests include *Mylabris oleae*, Chevr. ; *Otiorrhynchus meridionalis*, Gyll., and the Scolytids, *Hylesinus oleiperda*, F., *H. fraxini*, Panz., and *Phloeotribus scarabaeoides*, Bern. (*oleae*, F.). The last-named which only attacks trees that are in poor condition, may do great damage in dry seasons. It has three generations in a year, the autumn generation hibernating in the axils of the young branches and doing far more damage than the other two. For its control, the immediate removal of all prunings from olive trees to a distance of over 2,000 yards from the plantations has been made compulsory.

The insects recorded in a paper by Delassus, Brichet, Lepigre and Balakowsky (pp. 310–325) as attacking olives in Algeria, are largely the same as those found in Tunis. Others include the Coccid, *Gueriniella* (*Monophlebus*) *serratulae*, F., which is kept in check by the Agromyzid, *Cryptochetum grandicorne*, Rond., and by the Coccinellid, *Exochomus pubescens*, Küst. *Phloeotribus scarabaeoides* is found in all neglected, unpruned trees and is often entirely responsible for the poor crop in certain plantations ; its life-cycle lasts about 1½ months so that it has probably five generations in a year. It is parasitised by the Cleonymid, *Cheiropachis colon*, L., which occurs in fairly large numbers. The two most serious pests in Algeria are *Saissetia oleae*, which is present particularly in the coastal regions and in damp, sheltered situations, and is attacked by the same parasites as in Tunisia, and *Dacus oleae*, which is found in all olive groves, causing varying degrees of loss in different years. Parasites of *D. oleae* in Algeria are *Eulophus longulus*, Zett., *Eupelmus urozonus*, Dalm., and *Eurytoma rosae*, Nees, but their action is limited, as they are not specific to the fly and attack only the first

two generations ; *Opius concolor* occurs in a few localities, and its distribution is being studied.

In a paper by Bey-Rozet, summarised by Vivet (pp. 335–338), instructions are given for measures against *Dacus oleae* in Morocco, where bait-sprays are used, and the technique employed with success during 1927 and 1928 is described.

RAMAKRISHNA AYYAR (T. V.). **The Coccidae of the Prickly-pear in South India and their economic Importance.**—*Agric. Live-stock Ind.*, i, pt. 3, pp. 229–237, 3 pls., 16 refs. Calcutta, May 1931.

Previously recorded observations on the Coccids attacking prickly-pear (*Opuntia* spp.) in South India, and attempts to use them for the biological control of *Opuntia* are briefly reviewed. The species growing in South India are *O. monacantha*, *O. dillenii* and *O. nigricans*. The three species of Coccids present, which are exclusively cactus-feeders, are *Diaspis echinocacti*, Bch., which does very little damage to the plant, possibly owing to the activities of a Chalcid parasite ; *Dactylopius ceylonicus*, Green (*indicus*, Green), which was introduced into India in 1795, feeds exclusively on *O. monacantha* and has reduced this plant to almost negligible areas ; and *D. opuntia*, Ckll. (*tomentosus*, auct.), which is of recent introduction and which feeds only on *O. dillenii*. This is the commonest species of *Opuntia* in South India and as *D. opuntia* is being sent to different parts of the country where it is most needed, it is hoped that within the course of a few years prickly-pear will be rare in the country. In introducing the insects to fresh districts they should be liberated in shady parts of prickly-pear clumps in fine, calm weather ; within a week under favourable conditions the larvae will spread over the plants and soon begin to show the white cottony pubescence, the life-cycle requiring about 45 to 50 days. Within a few months, large clumps of the plant die away. In view of the fact that *O. monacantha* still occurs in isolated spots and its specific enemy, *D. ceylonicus* has become extremely rare, it is suggested that both species of prickly-pear with their respective Coccids should be cultivated at some centre for use in any future need. The original introduction of *D. opuntia* was apparently made by a private individual, and it is suggested that the Government alone should have the right to make such introductions and that a strict system of baggage examination and quarantine should be instituted at all ports of entry.

Descriptions are given of the characters distinguishing the Coccids discussed.

MILLER (N. C. E.). **Two new Species of Malayan Rhynchota.**—*Bull. Ent. Res.*, xxii, pt. 2, pp. 195–197, 3 figs. London, June 1931.

The new species described are the Coreids, *Derepteryx chinai*, from *Rubus* spp., and *Ochrochira rubrotincta*, from lemon, lime, *Hibiscus* and *Cosmos bipinnatus*, one individual being observed on tea.

BARNES (H. F.). **Gall Midges (Cecidomyidae) whose Larvae prevent Seed Production in Grasses (Gramineae).**—*Bull. Ent. Res.*, xxii, pt. 2, pp. 199–203. London, June 1931.

Brief notes are given on 18 species of Cecidomyiids, the larvae of which have been recorded from various parts of the world as preventing seed formation in grasses, with a list of the grasses attacked showing the gall midges concerned and the country of origin.

Barnes (H. F.). **A new predacious Gall Midge (Dipt., Cecidomyidae).**—*Bull. Ent. Res.*, xxii, pt. 2, pp. 205–207, 2 figs. London, June 1931.

Triommata coccotroctes, gen. et sp. n., is described from specimens reared in Sierra Leone from larvae predacious on a species of mealy-bug.

Taylor (J. S.). **Notes on the Biology of** *Laphygma exempta*, **Walk., and** *L. exigua*, **Hbn. (Lep., Noctuidae).**—*Bull. Ent. Res.*, xxii, pt. 2, pp. 209–210, 2 refs. London, June 1931.

Laphygma exempta, Wlk., periodically causes serious damage to maize in the eastern Transvaal; as many as three infestations may occur during a season, the first being usually the most extensive. A number of other cereals and grasses are also attacked, the latter being its natural food-plants. Oviposition occurs on the leaves at night, usually about the fourth day after emergence. The eggs are deposited in clusters of 43–220, the largest number obtained from one female being 682. The incubation period occupies 3–8 days, according to temperature, and the pupal one varies considerably with the time of the year, averaging from 14 days during February to 33 from mid-May to the end of June. During March, under laboratory conditions, the larval period averaged 21 days, but it is probably several days shorter at mid-summer and under natural conditions. When full grown, the larva enters the soil and builds an earthen cocoon just below the surface. It is probable that the adults migrate; in 1929, although a second generation of adults was present in large numbers, the moths suddenly disappeared, and no larvae were subsequently found in the field. The Braconids, *Disophrys iridipennis*, Cam., and *Chelonus erythropus*, Cam., and a Chalcid and a Tachinid have been reared from the larvae.

L. exigua, Hb., which is chiefly a pest of cotton and peas, usually begins to cause injury to the former early in January, and sometimes young plants are almost completely defoliated. Young pea plants are attacked during the winter, the damage being sometimes so severe as to necessitate replanting. The lengths of the various stages vary considerably with the climatic conditions. Oviposition, which takes place at night, may begin three days after emergence. The eggs are laid on the leaves in clusters of 8–100, and hatch in 3–12 days. During mid-March to early April, the larval period averaged 18 days. Pupation occurs just below the surface of the soil, the pupal period lasting 9–48 days and the pre-pupal 2. In the insectary, females lived up to 15 days. The adult of this species is also believed to migrate. The most important parasites reared from the larvae are a Tachinid and a Chalcid. Since infestation of cotton is most severe during the winter, when the parasites are least numerous, they are thought to play an important part in the control of this pest.

Chater (E. H.). **A Contribution to the Study of the natural Control of Gorse.**—*Bull. Ent. Res.*, xxii, pt. 2, pp. 225–235. London, June 1931.

This is an account of preliminary investigations on the biological control of gorse (*Ulex europaeus*), conducted at the Farnham House Laboratory of the Imperial Institute of Entomology and other localities in Britain on behalf of the New Zealand Government. Notes are given on the yearly cycle of the plant in the South, and its spread by adventi-

tious rooting, calcifuge habit, experiments on the germination, dispersal of seed, and establishment of seedlings and causes of mortality are discussed.

The damage caused by insects to the vegetative parts of the plant appears to be of little importance, and is chiefly due to *Apion ulicis*, Forst., Capsids, etc., that feed on the mesophyll or sap. A few Lepidopterous larvae, including *Anarsia spartiella*, Shr., attack the young shoots. It is to the flowers and pods that the greatest amount of injury is caused, and except for *Apion ulicis*, almost all of this is due to Lepidopterous larvae. The flowers are not attacked until April, the first insect to appear on the plants being *A. ulicis*, which eats out portions of the petals. Similar injury is caused by *Sitones* spp. During May, an unidentified Lepidopterous larva destroys the ovaries and anthers, thus preventing the formation of fruit and seed. It disappears towards the end of the month and is succeeded by *Anarsia spartiella*, *Depressaria costosa*, Haw., *Pseudoterpna pruinata*, Hfn., and other unidentified species, all of which do similar damage, *P. pruinata* attacking the shoots as well. On cessation of the flowering period, during the first half of June, *A. spartiella* migrates to the tips of the young shoots, where it was found to be heavily parasitised. The parasites of this moth reared include : *Paralitomastix varicornis*, Nees, *Pimpla inquisitor*, Scop., *P. detrita*, Hlmgr., and *Microbracon stabilis*, Wesm., from the larvae and *Phaeogenes* sp. from the pupae. Insects recorded as damaging the pods are : *Apion ulicis* [*cf. R.A.E.*, A, xvi, 540], *Cydia* (*Laspeyresia*) *ulicetana*, Haw., and *Coleophora albicosta*, Haw. Brief notes are given on the seasonal history of the last two, and the extent of the damage caused to the seeds by all three is shown in tables. Other insects of possible economic importance are *Apion scutellare*, Kby., which has been found on all the three species of *Ulex* occurring in Britain, and *Asphondylia ulicis*, Verrall, which forms galls on the flower-buds or young pods.

Up to the present the only insect that has been shipped to New Zealand is *Apion ulicis*. Most of the 100,000 individuals sent were despatched in cold storage, but one shipment was made on a living gorse plant. In spite of precautions, this method proved unsuccessful, both insects and plant dying on the way. Although gorse is scheduled as a noxious weed in New Zealand, there is apparently no desire to exterminate it, and it is much used for hedges. What is needed is some check on seed production which would make possible the artificial destruction of the plant in areas of poor grazing land where it has now become established, and at the same time prevent re-establishment by dispersal of seed from other areas. It is possible that the failure of *Apion ulicis* to breed successfully in New Zealand may in some way be connected with the change over of seasons involved in travelling to the opposite hemisphere. It is suggested that this would be a more easily surmountable problem to an insect such as *L. ulicetana* of which there are two generations, seasonally opposed to each other.

BRYANT (G. E.). **Some new injurious Phytophaga from South Africa.**—*Bull. Ent. Res.*, xxii, pt. 2, pp. 253–257, 5 figs. London, June 1931.

The species described include : the Eumolpids, *Rhembastus pomorum*, from young fruit and foliage of apple in the Transvaal, and *Scelodonta vitis*, from grape-vine in Natal ; and the Halticid, *Longitarsus crotalariae*, from sunn hemp (*Crotalaria juncea*) in the Transvaal.

Wilkinson (D. S.). **Five new Species of *Spathius* (Hym. Bracon.).**—*Bull. Ent. Res.*, xxii, pt. 2, pp. 259–265, 5 figs. London, June 1931.

Four of the species were taken in the adult stage without hosts in India, and the fifth, *Spathius piperis*, sp. n., is a larval parasite of *Lophobaris piperis*, Mshl., on *Piper nigrum* in Banka, Netherlands Indies.

Myers (J. G.). **Descriptions and Records of Parasitic Hymenoptera from British Guiana and the West Indies.**—*Bull. Ent. Res.*, xxii, pt. 2, pp. 267–277, 3 figs. London, June 1931.

An annotated list is given, based mainly on rearing records, with descriptions of the following new species: the Ichneumonid, *Spilocryptus diatraeae* from cocoons of *Diatraea* spp. (possibly a hyperparasite attacking *Ipobracon grenadensis*, Ashm.), and the Braconids, *Ipobracon puberuloides* and *I. pennipes* from *Diatraea* spp. and *I. aquaticus* from larvae of *D. saccharalis*, F., all from British Guiana, and *Microdus sacchari* from larvae of *Diatraea* from British Guiana and Trinidad. Keys to the species of *Ipobracon* and *Microdus* parasitising *Diatraea* spp. in British Guiana and the West Indies are included.

Ferrière (C.). **New Chalcidoid Egg-parasites from South Asia.**—*Bull. Ent. Res.*, xxii, pt. 2, pp. 279–295, 6 figs. London, June 1931.

The new parasites described are: the Pteromalids, *Acroclisoides indicus* from a Pentatomid on teak, and *Agiommatus acherontiae* from *Acherontia styx*, Westw., both in India; the Encyrtids, *Ooencyrtus malayensis* from *Cephonodes hylas*, L., *Papilio agamemnon*, L., *P. polytes*, L., and *Leptocorisa acuta*, Thnb., *O. corbetti* from *Podontia quatuordecimpunctata*, L., *O. erionotae* from *Erionota thrax*, L., all from Malaya, and *O. major* from *Attacus atlas*, L., in Java; the Aphelinid, *Centrodora idioceri* from *Idiocerus niveosparsus*, Leth., in Java; the Eulophids, *Pareuderus* (gen. n.) *torymoides* from *Alcides leeuweni*, Heller, a pest of cacao and kapok, on *Ceiba pentandra*, *Achrysocharis promecothecae* from *Promecotheca* sp. on coconut, both in Java, *Tetrastichus schoenobii* from *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.) in Malaya and Siam, and from *Spodoptera mauritia*, Boisd., in Malaya and Ceylon, and *T. gardneri* from a Pentatomid on teak in India; the Trichogrammatids, *Abbella mariellae* from a Membracid in Malaya, and *Haeckeliana brontispae* from *Brontispa longissima*, Gestro, in Java and from *B. froggatti* var. *selebensis*, Gestro, in Celebes; and the Mymarid, *Polynema elisabethae* from *Euproctis flexuosa*, Snell., in Java. Keys are given to the species of *Acroclisoides*, *Agiommatus* and *Ooencyrtus*, with a list of the Asiatic species of the last-named genus, indicating the locality and host.

Nicholson (A. J.). **Methods of photographing living Insects.**—*Bull. Ent. Res.*, xxii, pt. 2, pp. 307–320, 5 figs., 10 pls. London, June 1931.

A detailed account is given of instructions for photographing living insects, both in the field and the laboratory, by day and with the use of flashlight powder at night, with a description of a focussing attachment for use in the field.

Walton (C. L.) & Kearns (H. G. H.). **Carabid Beetles as Strawberry Pests in the Cheddar District.**—*J. Minist. Agric.*, xxxviii, no. 4, pp. 373–379, 12 figs. London, July 1931.

Damage to ripening strawberries has been found to be caused by the adults of certain Carabids. *Ophonus pubescens*, Müll. (strawberry seed beetle) causes the greatest injury by removing and devouring the seed contents ; *Pterostichus madidus*, F., and *P. vulgaris*, L., eat into the flesh of the berries, leaving holes in them; *Abax ater*, Vill., is much less injurious and *Nebria brevicollis*, F., and *P. cupreus*, L., although sometimes numerous, have never been observed to cause definite injury. In some cases from 50 to 70 per cent. of the crop has been damaged. The beetles, which are abundant from June to October and are mainly nocturnal in habit, are particularly troublesome when dry weather is followed by some rain during the picking period. Eggs are deposited in batches of 10–15 on the surface of damp soil or in the burrows made by the females. The larvae feed on a mixed animal and vegetable diet found in the soil and are generally mature by January. Many adults spend the winter deep in the soil or in worm holes, often in the banks surrounding small fields, and in spring both hibernating and newly-emerged adults become active, pair and oviposit. Damage by the beetles could probably be greatly reduced by removing shelter in which they can hibernate or hide during the day, by clean cultivation and by the judicious use of poultry, particularly on the headlands or as a barrier to check invasion of the beds. Traps or jars in the beds, either baited or not, are of some value but these, as well as dressings of naphthalene or sodium fluosilicate on the beds, require further testing. Pyrethrum sprays proved ineffective.

Section of Apiculture.—*J. Econ. Ent.*, xxiv, no. 3, pp. 581–643. Geneva, N.Y., June 1931.

This section includes the following papers : A Colony of Bees exposed to high external Temperatures, by W. E. Dunham (pp. 606–611) ; Metabolism of the Adult Honey Bee, by M.D. Farrar (pp. 611–616) ; The Effect of low external Temperatures on the Brood-nest Temperatures of a normal Colony of Bees during Summer, by W. E. Dunham (pp. 638–643) ; and the Evaluation of Bees for Pollination, by C. L. Farrar (pp. 622–627), in which records are given of data obtained during two seasons' observations at Amherst, Massachusetts, on the number of bees furnished during fruit bloom by overwintered colonies, package bees and nuclei. They indicate a pronounced advantage from the use of properly overwintered colonies.

Chambers (E. L.). **Directing Red Spider Control through the Use of special Tags on Nursery Stock.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 646–648. Geneva, N.Y., June 1931.

In an attempt to offer a service to the growers of evergreens without prejudicing the public against buying the plants, because of their tendency to be attacked by *Tetranychus telarius*, L., a scheme was devised whereby a special tag was attached to every lot or single specimen of evergreen sold, giving a brief description of the symptoms of injury, information that the red spider was prevalent everywhere and

was not introduced on nursery stock, and advice on simple control methods. The use of water under pressure, spraying with glue and dusting with sulphur were the three methods suggested as being easily applied. Successful results were obtained through the distribution of 25,000 of these tags in 1930, and requests have been made for similar ones concerning other classes of stock that lend themselves to simple treatments.

Haseman (L.). **Outbreak of Corn Earworm in Missouri.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 649–650. Geneva, N.Y., June 1931.

The drought of 1930, which caused serious damage to the maize crop in Missouri, was followed by an unusual development of the corn earworm [*Heliothis obsoleta*, F.] which was diverted to other crops. Late maize was severely damaged, and early in the autumn both ripening and small green tomatos were found to be seriously infested. When frost had killed tomatos out of doors, *H. obsoleta* infested those under glass, attacking not only the fruits but also the tender growth. Serious injury was caused early in the autumn to soybeans [*Glycine hispida*] in the south-eastern part of the State, the damage being particularly severe where soybeans were sown with maize. Lucerne was infested in a few scattered localities. During the last two years feeding has occurred on several varieties of geranium both outdoors and in the greenhouse, and in the latter the blossoms of different flowers such as *Calendula* have been attacked. An abnormal number of the larvae entered to soil to pupate in the autumn, and farmers were advised to plough infested fields in the winter where *H. obsoleta* had been abundant.

Brief notes on the occurrence of *H. obsoleta* in different parts of the United States by various authors are appended. W. H. Larrimer states that infestation in the northern States is likely to be due to migration of moths from the south. Autumn ploughing is therefore likely to be of little value as a control measure north of the Ohio river. Only 3–4 per cent. of the larvae that enter the soil in the autumn in central Virginia emerge as moths, but the rate of reproduction is high.

Symposium : The Effect of the 1930 Drought upon Insect Population.—*J. Econ. Ent.*, xxiv, no. 3, pp. 651–662. Geneva, N.Y., June 1931.

The beneficial and adverse effects of the abnormal drought of 1930 on various insects occurring on different crops, trees, and plants is discussed in a series of papers. Observations on the effect on pests of cereal crops in the central and eastern States, recorded by W. H. Larrimer (pp. 651–653), include a note on the corn earworm [*Heliothis obsoleta*, F.] [see preceding paper]. The drought materially inhibited the activities of the Hessian fly [*Mayetiola destructor*, Say], autumn infestations being in consequence generally low. Spring infestations were light, and dissections of the puparia indicated that high temperatures and dessication had caused an unusually high summer mortality of this stage in some places. In consequence of lack of moisture until mid-September, which prevented development of both insects and crops, no early multiplication of flies took place in self-sown wheat except in a few sections receiving local rains. The general rains of mid-September caused a wide-spread, but rather light, main emergence at the end of September and in early October, but continued drought in October was unfavourable to the establishment of this main brood,

or further pupation and emergence. The drought was favourable to grasshoppers, reports of local increase in abundance, damage and demands for control measures being received from practically all States in the drought area. Favoured by the drought, the chinch bug [*Blissus leucopterus*, Say] became abundant towards the end of the season in central Missouri, part of Illinois, Kansas and Oklahoma. The extreme heat that accompanied the drought resulted in the death after maturity of a small percentage of the larvae of the wheat jointworm [*Harmolita tritici*, Fitch], which were mature before the most severe stage of the drought occurred, but this was counterbalanced by the occurrence of only two instead of the usual three generations of *Ditropinotus aureoviridis*, Crawf., one of its most important parasites. The European corn borer [*Pyrausta nubilalis*, Hb.] was adversely affected by the hot dry season, and very little spread was observed owing to the lack of activity of the moths. Oviposition was much reduced, the eggs dried up or fell off the plants, and the survival of the larvae was far below normal. A review of the six-year period 1925–1930 shows the status of *P. nubilalis* in 1930 to have been slightly better than at the close of the season of 1926, but a serious development is likely to result from a possible favourable season in 1931.

Further notes on insects attacking cereal crops in Illinois are given by W. P. Flint (pp. 653–656). The dry hot weather was generally favourable to grasshoppers, the species most abundant in central and northern Illinois, where the increase was most noticeable, being *Melanoplus femur-rubrum*, DeG. Infestation by the Hessian fly [*Mayetiola destructor*] was reduced in the southern part of the State. Heavy mortality occurred in central Illinois during the summer (except in the extreme west) and one of 51 per cent. in northern Illinois in August. *B. leucopterus* increased in the centre and south to such an extent that a serious outbreak appears imminent, an abundant supply of food being present for both first and second broods even in the driest years. White grubs [*Lachnosterna*] were apparently unaffected either by the heat of the soil or by an insufficient food supply. Many joint-worm larvae [*Harmolita*] were apparently killed by the heat in central Illinois, but in the north where the drought was not so severe, the season was rather favourable to them. In central Illinois there was a very great increase in the abundance of leafhoppers, especially in orchards, but the clover seed Chalcid and the clover seed midge [*Bruchophagus funebris*, How., and *Dasyneura leguminicola*, Lintn.] and the lesser clover leaf weevil [*Hypera nigrirostris*, Hbst.] were greatly reduced in numbers, many individuals of the last-named dying before pupating and a still greater number dying in the pupal stage. The dry autumn was apparently favourable, on the other hand, to the clover leaf weevil [*H. punctata*, F.], the larvae of which were much larger and more abundant for the time of year.

Notes by H. Osborn (pp. 656–657) made on a circular tour in the central States ranging from Ohio to Kansas and referring particularly to leafhoppers occurring on cereal or forage crops show that in many fields they were practically exterminated, owing to the effect of the drought on the pastures and meadows. A period of possibly 2–5 years may be necessary for the re-establishment to the normal numbers of many of the species. The one most abundant in all localities was *Euscelis obscurinervis*, Stål, probably owing to its wide range of food plants. *Deltocephalus inimicus*, Say, which is usually found in numbers in all blue grass pastures was remarkably scarce. Among species

occurring on lucerne and clover there was a somewhat greater survival, *Platymetopius frontalis*, Van Duzee, *Agallia sanguinolenta*, Prov., *A. constricta*, Van Duzee, and *A. uhleri*, Van Duzee, being found in moderate numbers.

The influence of the abnormally dry weather on insects attacking shade and forest trees in Ohio is discussed by J. S. Houser (pp. 657–658), the outstanding occurrence being an invasion of bark beetles in conifer plantings, principally in the southern part of the State. A heavy and widespread infestation of *Ips grandicollis*, Eich., occurred in mid-September on ten-year-old plantings of *Pinus resinosa*, which had hitherto been exceptionally free from damage. By December the injury had become more intense, and additional numbers of trees had died. *P. strobus* in adjacent plantings was not observed to be infested. *I. grandicollis* was also taken on *P. erecta*, and other species found were *I.* (*Orthotomicus*) *caelatus*, Eich., and *Hypophloeus* sp. on *P. resinosa*, and *I. calligraphus*, Germ. Advantage has been taken of the known correlation between dry weather and damage by bark beetles by the practice of watering for the control of such species as *Scolytus quadrispinosus*, Say. The numbers of leaf-eating caterpillars such as *Anisota senatoria*, Abb. & Sm., *Heterocampa manteo*, Dbldy., *Halisidota maculata*, Harr., *H. caryae*, Harr., and *Symmerista albifrons*, Abb. & Sm., were significantly smaller throughout the forest areas of the State, and *Chalepus dorsalis*, Thnb., which frequently is excessively abundant in southern Ohio, did practically no important damage. The Phasmid, *Diapheromera femorata*, Say, which has recently been sufficiently abundant to cause 75 per cent. defoliation, and *Diprion* (*Neodiprion*) *lecontei*, Fitch, which in 1928 and 1929 caused the loss of some pines and plantings, were much reduced in numbers.

W. S. Hough (pp. 658–659) records inhibited development of the following insects attacking fruit: *Conotrachelus nenuphar*, Hbst. (plum curculio), because of the general absence of peaches and the extreme dryness of the soil which was unfavourable to the emergence of the adults from July till September; *Cydia* (*Laspeyresia*) *molesta*, Busck, probably owing to cold weather inhibiting oviposition by the spring brood, hot dry weather hardening the peach twigs and causing great mortality of second brood larvae, and scarcity of peaches; *Aphis pomi*, DeG., and *Anuraphis roseus*, Baker, and *Rhopalosiphum prunifoliae*, Fitch, the autumn migrants of which were reduced in numbers owing to the scarcity of green food plants for the summer generations. Insects favoured by the drought were: *Cydia* (*Carpocapsa*) *pomonella*, L., which was very abundant in most sections, oviposition being continuous from mid-May to early October; *Aspidiotus perniciosus*, Comst., which increased conspicuously in September; *Scolytus rugulosus*, Ratz., which was reported on cherry, peach and plum, and in restricted localities where apple trees were weakened by a severe outbreak of *Coleophora malivorella*, Riley, and then by drought, but was not generally serious; *Paratetranychus pilosus*, C. & F., which was more abundant than usual throughout the drought region; and the leaf-hoppers, *Typhlocyba pomaria*, McAtee, *Erythroneura obliqua*, Say, *E. dorsalis*, Gill., and *E. harti*, Gill., which were reported in increasing numbers in August and September, when specking of apples was more or less general.

N. F. Howard (pp. 660–662) records a material check in the development of *Epilachna corrupta*, Muls. (Mexican bean beetle) over a great part of the infested area in the east. Winter survival was high in

spite of delayed emergence from hibernation quarters due to dry weather, but reproduction was subsequently checked, so that the bean crop suffered little damage. Although low humidity and high temperatures combined were probably responsible for this, it appears that prolonged high temperatures during the summer months were probably the more important of the two factors. The temperature in bean fields exceeded 100° F. on many occasions during July and part of August in Ohio, and reached 121° F. at Columbus, Ohio, on 20th July. Atmospheric evaporation was 55 per cent. higher between late May and mid-September than the average for a similar period during the preceding four years. Actual field observations showed that the eggs were unable to hatch, and large numbers of adult beetles succumbed to the drought. In August the surviving beetles began to reproduce rapidly, concurrently with lower temperatures and rains, and from late September to the middle of October all stages were abundant in south-eastern Ohio.

PARKS (T. H.). **A State Program of Insect Control.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 663–666. Geneva, N.Y., June 1931.

Insect control work in Ohio, which consists of a few well-planned projects of long duration, is organised with reference to the importance of crop losses, the possibility or otherwise of preventing the loss in question and the character of the control method from an economic point of view. Existing related agencies are utilised in furthering these projects and informing the public. Work done by extension specialists in co-operation with county agents deal with the Hessian fly [*Mayetiola destructor*, Say] and insects attacking maize, fruit, and vegetable crops. An account is given of the organisation of the spray service, which aims at improving the timing of fruit sprays, and examples are given of how insect control information is disseminated.

SMITH (H. S.) & FLANDERS (S. E.). **Is *Trichogramma* becoming a Fad?**—*J. Econ. Ent.*, xxiv, no. 3, pp. 666–672, 1 ref. Geneva, N.Y., June 1931.

The following is taken from the authors' abstract: Some of the biological control work with *Trichogramma* appears to be tending in the direction of quackery, and until the complicated nature of the problem becomes fully appreciated, there seems to be little prospect of sound conclusions being arrived at as to its practical value.

WEBSTER (R. L.). **Trends in Codling Moth Control in the Pacific Northwest.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 672–676. Geneva, N.Y., June 1931.

An account is given of the development of various control methods against *Cydia* (*Carpocapsa*) *pomonella*, L., in the Pacific North-west where at the present time six cover sprays, in addition to the calyx one are applied in the heart of the apple-growing district, although the number is reduced in more isolated localities where the altitude is greater. The use of lead arsenate and oil sprays has increased greatly during the past few years, over 4,000,000 lb. lead arsenate and 14,000 barrels of oil having been used in 1930 in the Wenatchee-Okanagan district. The use of traps has been found to be of great value in

the timing of the sprays, one man devoting a large share of his time to collecting data from orchards in various localities. Although a considerable proportion of the oil used was for dormant treatments, a spray application consisting of lead arsenate used at the rate of 2 lb. to 100 U.S. gals. water to which is added 1 U.S. gal. commercial summer oil containing 75 per cent. actual oil is recommended for use during the summer to prevent entries by the second brood of larvae. The combination is most effective when applied at the maximum of oviposition, as determined by a study of moth emergence records. When used before 25th July, there has been no difficulty in reducing arsenical residues to below tolerance with ordinary washing methods.

The oil-nicotine combination, consisting of 1 gal. summer oil and nicotine sulphate at the rate of $\frac{3}{4}$ pt. to 100 gals., is recommended to replace lead arsenate late in the season on account of the residue problem. It proved fully as efficient as lead arsenate for cover sprays against the second brood. Foliage treated with cover sprays, including the oil-lead arsenate combination together with nicotine-oil, was found to be particularly free from injury by red spider, leafhoppers and Aphids.

The necessity for not only using extreme measures to reduce infestation but to make sure that this reduction is maintained in order to prevent a recurrence was shown by the fact that a single tree left unsprayed for the entire season as a check among adequately sprayed trees had 75 per cent. of the fruit infested. The insects from such a tree are, moreover, liable to become a source of infestation for the following year, regardless of the spraying programme.

Jones (G. D.). **An Effort in practical Control of the Codling Moth in a Missouri Apple District.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 676–681, 3 diag. Geneva, N.Y., June 1931.

A co-operative experiment against *Cydia* (*Carpocapsa*) *pomonella*, L., was carried out from 20th April to 20th July, 1929, over an area of 1,000 acres of bearing apple trees in Missouri. Studies were undertaken under both orchard and insectary conditions. In the previous season, the percentage of infested fruit at picking time had been fairly high. The rainy, cold season made it impossible to maintain a cover of spray material on fruit and leaves against the first brood larvae, and most of the growers had to abandon the cluster bud spray. Lead arsenate was applied at blossom fall and during the periods of larval entry by the first and second broods. The methods employed varied according to the conditions encountered, and although the cleanest fruit was generally found in the lower two-thirds of the tree, many growers grew equally clean fruit in the tops as well. Spraying dates were calculated according to comparative data secured in the insectary, under outside conditions and from baits, and growers notified by mail or telephone. The growers found at the end of the season that they had harvested an increased percentage and had been saved the expense of one spray.

Munro (J. A.). **Carpenter Worm Injury to Ash in North Dakota.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 682–685, 3 refs. Geneva, N.Y., June 1931.

Prionoxystus robiniae, Peck, the eggs, larvae and both sexes of which are briefly described, is causing serious injury to green ash (*Fraxinus lanceolata*) in the neighbourhood of Fargo, North Dakota. Several

other trees in the vicinity that are known to be susceptible to *P. robiniae* do not appear to be attacked. In a wood comprising two acres, where about one-half of the trees were ash, 90 per cent. of these were found to be infested during the summer of 1930. Observations made by means of caging the trunks of infested trees during the spring showed the period of emergence to be 6th–14th June. The flight of the moths lasted till early July. Egg-laying began one or two days after emergence, apparently on the same trees from which the moths emerged, and, in the case of 8 moths observed, was completed within two days. Hatching extended over a period of a week beginning on 25th June. After feeding for a short time on the empty shells, the larvae migrate in all directions, entering the bark either through old tunnels or by cutting new ones. Some were observed to descend to the ground. The method of boring and the injury caused are described. The larvae require 3 years for development, during which time much of the wood is damaged, and infested trees, being subject to reinfestation, are almost certain to be killed.

The most satisfactory of the control measures suggested is the cutting down and burning of infested trees during the autumn and winter, including the destruction of the stumps before the adults can emerge. Trees thus removed could be replaced by species not susceptible to injury by *P. robiniae*. In the case of trees too valuable to destroy, carbon bisulphide may be introduced into the tunnels, or individual trees may be screened and the moths destroyed.

Chapman (P. J.). **Apple Maggot Studies in 1930.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 686–691, 1 fig. Geneva, N.Y., June 1931.

The following is the author's abstract : Three major phases of the problem in regard to *Rhagoletis pomonella*, Walsh, are considered with the object of meeting the requirements imposed by the 1930 restrictions governing apples for export. These studies include spraying with lead arsenate to poison the flies, spray residue and sterilisation of fruit after harvest. Cage records indicate that the initial and maximum emergence of *R. pomonella* is about one week later in the Lake Champlain area of New York as compared with the Hudson River Valley. Applications of lead arsenate about 5th July and 20th July appeared to give good control this season with an indication that an additional treatment early in August was necessary in certain Lake Champlain Valley orchards. Tests involving 100 bushels of apples comprising seven varieties show that cold storage at 30–33° F. of a month's duration will kill a very high percentage of larvae in harvested fruit.

Tolles (G. S.). **Controlling the Fruit Tree Leaf-roller** (*Archips argyrospila*) **with Oil Emulsions.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 692–694. Geneva, N.Y., June 1931.

Laboratory tests in the control of *Tortrix* (*Archips*) *argyrospila*, Wlk., which has recently been spreading considerably in Michigan and is now to be found throughout the State, have been carried out during the winter of 1930 with a number of oils, to determine their efficiency as ovicides. Several proprietary oils were applied at various strengths with a hand pump during the dormant period to some hundreds of branches 24–30 ins. long, each bearing a number of egg masses almost in hatching condition. The results obtained were highly satisfactory in

nearly every case. Drenching the treated branches with a pressure hose had apparently no effect on the efficiency or permanence of the sprays. It was found that where one or two eggs in the masses, which normally contained about sixty, had already hatched, the rest of the eggs could be prevented from hatching by the application of an oil spray. Many small larvae observed during the tests suspended on silken threads were blown about to other branches or plants in the vicinity, indicating a possible method of spread. Subsequent orchard tests with the same materials gave practically identical results, and no appreciable spray injury was noted. The largest number of egg masses occurred on the upper sides of the branches on two- and three-year-old wood. If the infestation grows more serious, many eggs will probably be found on the larger limbs. To obtain commercial control, it is necessary to ensure complete cover of each egg mass, and this involves the application at proper strength of a good oil just before the buds show green and after the danger of frost is past.

Ginsburg (J. M.) & Mann (R. F.). **Studies with Hydrated Ferric Oxide as Corrective and Sticker for Lead Arsenate and Nicotine Tannate.**—*J. Econ. Ent.*, no. 3, pp. 695–701, 8 refs. Geneva, N.Y., June 1931. (xxiv

The following is taken from the authors' abstract and conclusions: Tests with several grades of hydrated ferric oxide were carried out for the purpose of determining their value as stickers and correctives for arsenical injury to apple foliage. It was established that hydrated ferric oxide itself does not injure apple or peach foliage, and when mixed with lead arsenate, or lead arsenate and liquid lime sulphur, increases the adhesive properties of the former and at the same time prevents arsenical injury. A product consisting of mixtures of ferric oxide and powdered skim milk was used as a spreader, sticker and corrective with lead arsenate and nicotine tannate, and it was found that in the case of each of the insecticides, more remained on the foliage than when lime was used as a corrective. Combined fungicides and insecticides containing sulphur and lead arsenate, in which this product is included instead of lime, can be prepared and stored without decomposition.

Eyer (J. R.) & Rhodes (H.). **Preliminary Notes on the Chemistry of Codling Moth Baits.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 702–711, 1 pl., 3 diag., 5 refs. Geneva, N.Y., June 1931.

The following is the authors' abstract: Chemical analyses of molasses baits for *Cydia* (*Carpocapsa*) *pomonella*, L., during their periods of maximum attractiveness reveals their attractant value to be most closely associated with certain changes in the decomposition of the sugars which precedes the formation of alcohol and acetic acid and is first evidenced by a decrease in the glucose content of the baits. These phenomena, which are probably attended by the formation of esters, the exact composition of which is as yet undetermined, are of primary importance. The formation of alcohol and the evolution of gas are important secondary factors, while the production of high yeast populations and the conversion of alcohol into acetic acid are only slightly attractive or actually repellent. Under New Mexico conditions, where the average mean daily temperature for the period during which adults

of *C. pomonella* are most active (1st May to 30th September) is 73·5° F., the effectiveness of molasses baits is actually decreased by adding yeast in commercial form, whereas on the other hand it is materially increased and the period of attractiveness prolonged by the addition of certain preservatives, particularly benzoate of soda, which delays fermentation.

A number of commercial esters were tested, and the following are listed in order of their attractiveness : iso-butyl phenyl acetate, geranyl formate, ethyl oxy-hydrate, diphenyl oxide, citronellal, bromo styrol, methyl cinnamate. Most of these materials when used alone were not as attractive as plain molasses baits, and their attractiveness seems to be associated with their chemical composition, boiling point and characteristic odour.

Burrell (A. B.) & Parris (G. K.). **Injury to Apple Trees from the Use of a Calcium Cyanide raw Linseed Oil Mixture in controlling the Round-headed Apple-tree Borer.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 711–716, 1 pl. Geneva, N.Y., June 1931.

In 1930 severe injury to fruit trees occurred in the Champlain Valley, New York, as a result of the use of calcium cyanide-raw linseed oil mixture against *Saperda candida*, F.

A study of the injury and the factors connected with its development indicated that the injury was most severe when the cambium was exposed by cutting out readily accessible borers with a knife before the material was applied. A strip of dead bark originated at the point where the cutting was done and extended vertically for varying distances but no such strip developed where cutting was not followed by the application of cyanide mixture. The cambium was, moreover, found to be destroyed for a distance of $\frac{1}{4}$–$\frac{1}{2}$ in. beyond the borer tunnel by the application of the mixture, even when no cutting was done. In the most serious case recorded, 800 out of 1,000 four-year-old trees showed commercial injury, 300 of these being probably beyond recovery.

Preliminary tests indicate that the oil influences the amount of the injury, probably by its effect on the penetration of the calcium cyanide, as none of the 5 oils tested had any injurious effect when applied alone either to freshly exposed cambium or to sound bark. Since the least injury resulted from a mixture containing castor oil, this should be further tested as to its efficiency and safety in borer control. It is possible that the extent of the injury is partly dependent on the temperature prevailing at the time of application, and it might be less if the treatments were made in the cooler part of the year.

Shepard (H. H.). **The relative Toxicity of Rotenone and Nicotine to *Aphis rumicis* L. and Mosquito Larvae.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 725–731, 6 refs. Geneva, N. Y., June 1931.

On the basis of previous studies of the relative toxicity of rotenone and nicotine, which are briefly reviewed [*R.A.E.*, A, xi, 249 ; xiv, 512], both these materials were tested against *Aphis rumicis*, L., according to methods described in a paper already noticed [xviii, 553]. The results secured confirmed those previously obtained, indicating that the toxicity of rotenone as a contact insecticide is definitely higher than that of nicotine. In continuation of tests already noticed [xix, 101],

Davidson, in a private communication to the author, reports that individual tests on Aphids such as *Brevicoryne brassicae*, L., and *Myzus persicae*, Sulz., with rotenone suspensions at 1 : 100,000 but treated in different ways, resulted in 89·0, 48·4, 64·0, 22·4 and 46·5 per cent. mortality at the end of one day, but at the end of four days the same experiments respectively gave 95·6, 88·1, 95·5, 70·0 and 90·7 per cent. mortality, indicating the desirability of following the course of poisoning until the action is complete.

In order to eliminate errors in the determination of toxicity that might be due to the influence of the solvent, tests were made of stock solutions of rotenone in which different solvents had been used. It was found that, in general, sprays made from alcohol and acetone stock solutions were of the same toxicity, and no deterioration in these stock solutions was detected. A study of the effect of ordinary spreading agents upon the efficiency of rotenone suspensions allowed to stand for a considerable time before use gave indecisive results in tests in which soap and saponin were used. As the hydrolysis of soap in water produces free alkali, whereas saponin has an acid reaction, similar tests were conducted to determine the effect of acidity or alkalinity on the toxicity of rotenone. After standing for 24 hours, the rotenone in the acid suspension had settled almost entirely, whereas settling in the alkaline suspension was negligible. The behaviour of the rotenone in acid suspension suggests that similar settling from saponin suspensions is due to the acidity of saponin. The addition of alkali seems to reduce toxicity more than does that of acid, but an acid reaction of the spray brings about either larger particles or a clotting of the particles of rotenone so as to make them settle out. It therefore seems possible that rotenone suspensions are most stable if maintained as nearly neutral as possible.

RICHARDSON (C. H.) & HAAS (L. E.). **The Toxicity of Acid Lead Arsenate to the Larva of the Colorado Potato Beetle.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 732–736, 3 refs. Geneva, N.Y., June 1931.

An account is given of studies in which an attempt was made to apply, with some modifications, quantitative methods previously noticed [*R.A.E.*, A, xviii, 311, 481] for estimating the relative toxicity of stomach poison insecticides to *Leptinotarsa decemlineata*, Say (Colorado potato beetle). It was estimated that the median lethal dose of acid lead arsenate for a larva of about 0·144 gm. weight is 0·3 mg. per gm. of body weight, or about three times as much as that found for the larva of *Bombyx mori*, L. This difference in the degree of toxicity is due in part to the greater vigour of *L. decemlineata*. No estimate has yet been made of the amount of lead arsenate lost in regurgitation, the quantity ejected and the time of ejection being quite variable. It is probable that much of the so-called repellent effect of arsenical compounds on insects is in reality incipient poisoning with accompanying loss of appetite. The larvae also frequently fail to eat equal quantities of the upper and lower leaf disks together with the intervening arsenical suspension, and efforts to force them to feed from the edge of the sandwich usually result in their refusal to feed at all. Data taken from a few tests with Paris green indicate that the maximum lethal dose is less than one-third that of acid lead arsenate. In both cases the consumption of food by the larvae was less and the feeding time shorter on poisoned than on normal food.

de Ong (E. R.). **Refined Pine Tar Oil for Orchard and Garden Use.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 736–743, 3 refs. Geneva, N.Y., June 1931.

Recent developments in the factory process of treating certain of the pine tar distillates to eliminate the danger of foliage injury have increased their effectiveness both as insecticides and also as a carrier for other active chemicals such as nicotine and oil and water soluble metallic salts. Distillates containing appreciable amounts of tar should not be used, as the latter may contain a dangerous amount of organic acid which may increase by natural oxidation. Pine tar oil is used alone or in combination with nicotine or copper resinate for the control of Aphids, thrips or the younger stages of unarmoured scales. Dilutions of water soluble pine tar oil of 1 : 100 have caused no injury to apple, pear, peach or beet foliage at a maximum temperature of 100° F. Water-soluble pine tar oil containing sodium should not be used in combination with lead arsenate, and alkalis and strong concentrations of copper sulphate also throw the oil out of solution. Nicotine in a 95 per cent. concentration enters readily into solution with pine tar oil, but a difficulty exists in obtaining a solution in the presence of large amounts of water. It is concluded from the data obtained that the highest concentration of nicotine consistent with economy and safety should be used in all such combinations of nicotine and oil. Comparative tests with treated pine tar oils and refined petroleum oils show that pine tar oil has a greater fungicidal value than petroleum oil, and may also act as a carrier for copper resinate, which it dissolves readily, giving both an insecticidal and fungicidal effect. The combination of pine tar oil and copper resinate may be added to petroleum oil and the blend emulsified in the usual way. Other insecticidal values of pine tar oil are quoted from the literature [*R.A.E.*, A, xvii, 371 ; B, xi, 122 ; B, xiv, 26].

Little (V. A.). **A preliminary Report on the insecticidal Properties of Devil's Shoe-string,** *Cracca virginiana* **Linn.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 743–754, 11 refs. Geneva, N.Y., June 1931.

This is a more detailed account of an investigation already noticed [*R.A.E.*, A, xix, 319] in regard to the development of a fish poison for insecticidal purposes found in *Tephrosia* (*Cracca*) *virginiana* (devil's shoe-string). Aqueous suspensions of the powdered roots compare favourably in toxicity with derris, pyrethrum and nicotine sulphate (40 per cent.). Field experiments show that it has possibilities as a contact spray for Aphids and other insects. The supply at present is probably adequate for commercial purposes, but owing to the marked variations in the toxicity of the plant, it may not be possible wholly to utilise it. It is essential to carry out extensive experimental work on the factors influencing its toxicity, growing and harvesting, and its chemical constitution, in addition to exhaustive experiments on many forms of insect under both laboratory and field conditions.

Metzger (F. W.) & Whitcraft (A. R.). **A Power Spray Outfit adapted for applying small Quantities of Material.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 754–757, 1 pl., 1 fig., 1 ref. Geneva, N.Y., June 1931.

A description is given of a power spray outfit that can be used for applying small quantities of material under field conditions. The pump is of the piston type, mounted on an iron base 6×30 inches and

coupled to a single cylinder, 4-cycle petrol engine of ½ horse power. An endless V-belt connects engine and pump, and the engine, which is equipped with a foot starter, is bolted to a heavy wooden base and mounted on a truck, a 10 gal. wooden keg, having one end open, being also mounted on the base to serve as the spray tank. The efficacy of the method of agitation, which is described in detail, was tested by filling the tank with lead arsenate at the rate of 3 lb. to 50 U.S. gals. water and spraying 1 gal. into each of 10 buckets. No appreciable difference in the quantity of lead arsenate present could be detected between the buckets when the material had been allowed to settle. The outfit was run so as to deliver 3 gals. per minute ; this enabled the operator thoroughly to cover the tree before the material was exhausted. Fifty gallons of water contained in 5-gallon tins were carried in the forward part of the truck.

This apparatus, the total cost of which was about £25, exclusive of the truck, was used satisfactorily and extensively in experimental work during the summer of 1930, when over 2,500 gals. spray material were applied on approximately 450 peach and apple trees, with considerable saving of labour as compared with the hand pump used in previous years.

Fulton (F. A.) & Chamberlin (J. C.). **A new automatic Insect Trap for the Study of Insect Dispersion and Flight Associations.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 757–761, 1 pl., 1 fig., 4 refs. Geneva, N.Y., June 1931.

The trap described, which automatically receives and retains the insects borne by a representative moving current of air, is an adaptation of the wire maze type of apparatus for air filtration and purification and comprises essentially a short tubular air passage provided with a parallel series of off-set screens through which the air moves. A series of eddy currents results within the maze thus formed and tends so to direct the insects' movements that they ultimately work their way down through a funnel into a glass cyanide jar. The mesh of the series of screens progressively decreases in the direction of the air current, the first being large enough to admit the largest insect it is desired to trap, and the last being small enough to retain the smallest. A funnel-like baffle plate surrounding the entrance is designed to concentrate the air flowing through the trap. Free rotation of the trap is provided by either mounting it on, or suspending it from, a fixed bearing, and orientation with the wind is obtained by means of a vane. A slight breeze is necessary for its proper functioning, but correctly mounted traps should be equally effective in fixed positions, if four or more were set in a square or circle oriented with the cardinal directions. The advantages and efficiency of these traps, which are mounted at various elevations on tall poles, are discussed. The data secured in traps operated from spring to autumn in 1930 in the territory of southern Idaho demonstrate the fact that the influx of *Eutettix tenella*, Baker, was with the prevailing westerly and north-westerly winds, and further showed that the movement was continuous throughout the season.

Rude (C. S.). **Cotton Boll Weevil has no Hibernation in Laguna District of Mexico.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 761–762. Geneva, N.Y., June 1931.

In a district of north-central Mexico, a newly emerged adult of *Anthonomus grandis*, Boh., was found on 17th February, among cotton

bolls picked the preceding autumn. Three live pupae were also discovered while dry cotton bolls were being cut open on 28th February, and two old weevils were taken on 16th March from a flight screen in a field where cotton stubble had been ploughed under about a month previously. These facts indicate that *A. grandis* does not hibernate in this part of Mexico, which is a desert plateau about 3,700 ft. above sea level, where cotton is raised by means of irrigation, the annual rainfall being less than 9 inches.

SEIN (F.). **The Pickle Worm in Chayote in Porto Rico.**—*J. Econ. Ent.*, xxiv, no. 3, p. 762. Geneva, N.Y., June 1931.

Margaronia nitidalis, Cram., a well-known pest of cucurbits in Florida, is recorded as breeding on *Sechium edule* in Porto Rico, the first infested fruits being found in October 1930. Inspection of fruit in the market showed the infestation from October 1930 to March 1931 to be only 5–10 per cent. Cucumbers found in the same locality in January 1931 were heavily infested with *M. hyalinata*, L.

SNAPP (O. I.) & THOMSON (J. R.). **The Effect of the Sun on Plum Curculio Larvae in Peach Drops.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 762–763. Geneva, N.Y., June 1931.

In an experiment carried out in 1930 to determine the effect of the sun on the larvae of the plum curculio [*Conotrachelus nenuphar*, Hbst.] in dropped peaches, heavily infested fruit was spread out in a thin layer on top of 5 ins. of clay soil in each of two large boxes. Daily records of adult emergence from 29th April showed that in spite of disturbance of the soil by fowls that probably destroyed some larvae and pupae, 167 adults of *C. nenuphar* emerged from one of the boxes situated in the shade of large pecan trees between 7th June and 6th August, whereas not a single beetle emerged during the entire season from the other box which had been continuously exposed to the sun.

MILLS (A. S.) & LEONARD (M. D.). **The Eggs of the Lima Bean Pod Borer in Porto Rico.**—*J. Econ. Ent.*, xxiv, no. 3, p. 763. Geneva, N.Y., June 1931.

Further observations on the life-history of *Maruca testulalis*, Geyer, are recorded from Porto Rico [*R.A.E.*, A, xix, 488], and a description of the egg is given.

CHAPMAN (P. J.), PARKER (M. M.) & GOULD (G. E.). **The *Euonymus* Scale.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 764–765. Geneva, N.Y., June 1931.

Chionaspis euonymi, Comst., has caused serious injury to *Euonymus* in Virginia for the past 50 years, and is now practically the only factor limiting the cultivation of this shrub. Scalecide 1 : 10 applied to *Euonymus japonica* on 25th February 1930 gave good control, but caused considerable injury to new leaves. In February 1930 several heavily infested shrubs were fumigated *in situ* with hydrocyanic acid gas generated from Cyanogas " A " [*R.A.E.*, A, xiv, 74] at the rate of ½ oz. to 100 cu. ft., the exposure period being 1 hour. Almost complete control was secured by two treatments, one made on 14th February

with a temperature of 47° F. and relative humidity 79, and the other five days later when the temperature was 68° F., relative humidity 42, and no injury was caused to the bushes.

Leonard (M. D.). *Leptoglossus gonagra* **Fab. injuring** *Citrus* **in Porto Rico.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 765–767. Geneva, N.Y., June 1931.

Investigation of injury to oranges in Porto Rico during the latter part of November 1930 showed it to be due to *Leptoglossus gonagra*, F., which appears not to have been previously recorded as injurious to *Citrus*. The bugs seemed to be attracted from their natural food-plant, a weed, *Momordica charantia*, which was growing among the cover crop, only to ripening fruits from which they extracted the juice, cutting into the skin for a considerable distance towards the centre. The weed, on which the nymphs were found feeding in large clusters, was growing freely and furnished an excellent breeding place and a continued source of infestation. Several batches of eggs of *L. gonagra* were also observed on the wild food-plant. Both eggs and nymphs are briefly described.

The control measures adopted, the application of which was stated in March 1931 to have occupied about one month, included the removal of the cover crop including *M. charantia*, and ploughing over the ground throughout the orange grove. The application of a pyrethrum-oil contact spray at a dilution of 1 : 600 was found to kill at least 90 per cent. of the adults on the fruit. Both nymphs and adults were also sprayed where they were found still alive on the cut piles of the cover crop. One other case of injury to *Citrus* was recorded from a neighbouring grape-fruit grove where similar injury had caused about 10 per cent. of the fruit to fall, and the same type of control measures had prevented further damage.

Examination of the literature has revealed only one case of injury by *L. gonagra* outside Porto Rico [*R.A.E.*, A, vi, 251], but numerous records of injury caused by other species of *Leptoglossus* to various fruits and vegetables in addition to *Citrus* are quoted.

Mail (G. A.). **Food Preferences of Grasshoppers.**—*J. Econ. Ent.*, xxiv, no. 3, pp. 767–768. Geneva, N.Y., June 1931.

In the course of breeding *Melanoplus bivittatus*, Say, and *M. differentialis*, Thomas, in a greenhouse, about 50 per cent. of the nymphs, which were being reared on tender spring wheat and *Tradescantia*, escaped accidentally. A list is given of the 26 kinds of plants present in the greenhouse, and the extent of injury sustained by them. Only grape fruit and a palm (*Washingtonia*) were destroyed to any great extent, but these were heavily attacked, the palm in spite of the tough, stringy nature of its fronds suffering great injury.

Isely (D.) & Horsfall (W. R.). **The Chinch Bug as a Rice Pest.**—*J. Kansas Ent. Soc.*, iv, no. 3, pp. 70–73, 4 refs. McPherson, Kans., July 1931.

In Arkansas, injury to rice by *Blissus leucopterus*, Say [*cf. R.A.E.*, A, xvi, 387] only occurs before the fields are flooded, or late in the season after they have been drained before harvest. It is most pronounced when drought occurs in successive years, as this favours the

development of the bugs in adjacent grasslands. Severe local injury of the first type, which was caused by the first generation, occurred in 1924, 1925 and 1930. In some instances the crop serves as a secondary food-plant for the nymphs of the spring generation, which migrate from adjacent fields of grass and oats. Over-wintered adults may also oviposit on young rice, but their progeny are seldom able to develop rapidly enough to cause any appreciable injury before the fields are flooded. Late season injury occurred in 1930, though no extensive damage was caused. As soon as the outbreak was observed, the migration of the bugs was prevented by flooding the canals around the fields or the fields themselves. In dry seasons burning the grass adjacent to the fields a week before draining is recommended.

Entomology.—*41st Ann. Rep. Alabama Agric. Expt. Sta. 1929–30,* pp. 30–32, 37. Auburn, Ala. [1930.] [Recd. July 1931.]

Studies by J. M. Robinson and F. S. Arant on the control of the boll weevil [*Anthonomus grandis,* Boh.] with calcium arsenate dust were continued in 1929 [*R.A.E.*, A, xvii, 36; xviii, 222]. On the sandy loam plots the infestation was kept below 20 per cent. until 3rd September by three applications beginning on 12th August, which resulted in an increased yield of 46 lb. of seed cotton per acre. On the untreated plots the infestation had reached 95 per cent. The average increase in yield from dusting during the last 6 years was dependent on the time of planting, rate of fertilisation and the percentage of infestation. The yield of seed cotton was increased 42 lb. per acre by dusting alone, and 184 and 307 lb. per acre with the addition of 500 and 2,000 lb. fertiliser respectively.

On clay plots the infestation was 38 per cent. on 18th June. Three applications of calcium arsenate at intervals of 4–11 days reduced it to 2 per cent. and kept it below 20 per cent. till 15th July. During a second series of five applications, two of which were washed off by the rain within 24 hours, the infestation varied from 6–36 per cent. till 6th August. On 10th August a ninth application was made to protect the young bolls. On the untreated plots the infestation had reached 83 per cent. The increase in yield was 223 lb. of seed cotton per acre and the average increase over the 6 year period was 252 lb.

L. L. English states that unrefined oils are more likely to cause injury to satsuma oranges than refined ones when applied in the late autumn to trees which are subsequently exposed to severe frosts. Though the trees quickly recovered, severe defoliation resulted from the use of Bordeaux or oil-Bordeaux combinations (being more severe with white oil-Bordeaux combination than with straw oil-Bordeaux combination) on trees that had been defoliated by severe winter frosts and on which new foliage was appearing. The application of lime-sulphur six weeks after that of oil resulted in injury. The amount of oil retained by citrus foliage, though generally increasing with the viscosity, is not proportionate to it, as the increase becomes less when the viscosity approaches 80 secs. Saybolt at 100° F. Heavy oil residues may remain on the foliage for three months or longer. The amount of oil retained by the foliage was practically proportionate to the concentration of the emulsion. There is apparently no difference between the residue resulting from straw and white oils that have the same physical properties. Oil emulsions inhibit normal colouring of the fruit of satsuma oranges. Usually the higher the viscosity and the concentration used the more likely there is to be retardation of ripening.

The life-history of *Curculio* (*Balaninus*) *caryae*, Horn., is recorded by H. S. Swingle. This weevil is potentially the most injurious insect pest of pecan in central Alabama. In one orchard it has caused a loss of over 50 per cent. of the crop for several years, the damage resulting from feeding and egg-laying within the nuts. The adults emerged throughout August, and oviposition did not begin until the kernels became firm, when an average of 22·4 eggs were laid by each female. About 3 eggs were usually deposited in each nut, though as many as 12 have been found. The incubation period averaged 7·7 days and the larval one within the nut varied from 15 to 117, the majority of the larvae emerging in about 25 days. The remainder of the larval stage is spent in a cell at a depth of 3–6 ins. in the soil. Some individuals pupated and emerged the following September.

J. F. Duggar states that counts of samples of lucerne from various localities showed that 10–80 per cent. of the stems had been girdled by *Stictocephala festina*, Say. In dusting experiments, infestation was reduced to 9 per cent. in 34 days by an application of sodium fluosilicate on 9th August, that of an adjacent untreated plot being 16 per cent.

EYER (J. R.). **The Relation of Temperature and Rainfall to Outbreaks of the Grape Leafhopper,** *Erythroneura comes* **Say.**—*Ann. Ent. Soc. Amer.*, xxiv, no. 2, pp. 238–259, 17 graphs, 25 refs. Columbus, Ohio, June 1931.

During observations on a series of outbreaks of *Erythroneura comes*, Say (grape leafhopper) in Erie County, Pennsylvania, in the years 1920–25, detailed records of the activities of the insect and weather conditions were collected, and from these an attempt is made to determine the probable relation between weather factors and abundance of the leafhopper. The literature on outbreaks of the leafhopper, with particular reference to the Lake Erie region, the definition and climatological characteristics of that region, the seasonal history of the insect with relation to normal weather variations and to temperature and rainfall during the period studied, and the comparison of weather conditions influencing the outbreaks of 1920–25 with those of other years (1901–3 and 1911–13) are discussed. Parasitic and predatory factors were negligible during the period reviewed. The author considers that the seasonal fluctuations observed were clearly occasioned by weather conditions, particularly temperature and precipitation, and in summarising his conclusions he states that in the establishment and maintainance of a definite seasonal population through the medium of the first generation, temperature bears a direct relation to the normal seasonal occurrences of emergence from hibernation, oviposition and rate of development of the nymphal instars, high temperatures hastening these events and low ones retarding them. Until a certain sum total of spring temperatures, above a definite mean, is reached, the development of the first generation and occurrence of subsequent generations are necessarily delayed. The indications are that spring temperatures exceeding 65° F. are necessary for normal development, temperatures between 65° and 70° F. being requisite to ensure a steady advance of the seasonal cycle. Each of the periodic changes is likewise dependent on rainfall, light precipitations favouring the establishment of high populations. Years of severe outbreaks are found to be preceded by, and associated with, dryish spring weather and dryness in the preceding autumn. When the reverse weather conditions occur, periods of

repression result. The months of June, for the spring, and July, September and October, for the autumn, have the greatest significance in this respect. Temperatures below 64° F. in May and June, particularly when accompanied by monthly precipitations greater than 3·5 inches, were unfavourable for development, as also were autumn temperatures below 58·5° F. when associated with precipitation exceeding 3·5 inches. Comparisons with weather conditions during earlier outbreaks revealed the same principles underlying these earlier occurrences.

LATHROP (F. H.) & NICKELS (C. B.). **The Blueberry Maggot from an ecological Viewpoint.**—*Ann. Ent. Soc. Amer.*, xxiv, no. 2, pp. 260–281, 4 pls., 3 diag., 13 refs. Columbus, Ohio, June 1931.

Ecological relationships are very definitely exemplified in the case of *Rhagoletis pomonella*, Walsh, infesting blueberries (*Vaccinium*) on the coast of Maine, where the crop is estimated to produce over £200,000 annually. This area is wild land from which the forest has been removed and receives but little care. The climate and topography of the region is described, as well as the process of burning over the land, which is done every third year in early spring. During the summer following the burning, the plants respond by a greatly accelerated growth, but there is no fruit. At this season there is a normal emergence of *R. pomonella* on the burned areas, but owing to the absence of fruit, oviposition does not occur, so that there is a great reduction in the numbers of the fly. During the next summer, there is an abundant crop of berries, but the fly population is low. Infestation of this crop occurs, however, owing to the migration of flies from unburned areas, and emergence from puparia carried over in the soil for two seasons, the number of which is considerable. Flies have been known to emerge from puparia as long as four years after the larvae had entered the soil. Under favourable conditions the infestation increases rapidly on the first crop of blueberries and reaches a maximum on the second. The larvae have been observed in most of the berries found in association with the blueberry, of which nine species are enumerated ; the bunchberry (*Cornus canadensis*) is frequently abundant, and as this plant may flower and fruit every year, whether the land is burned or not, individuals may survive on it to reinfest the new crop of blueberries. The abundance of this Trypetid varies considerably in different phases of the plant succession on the wild areas. Where the plant grows sparsely among tall shrubs and along the margins of forests, the incidence of the fly is low, owing to the scarcity of berries. As the development of the blueberry is encouraged, the incidence increases, though somewhat less rapidly than the yield of berries, so that the percentage of infested berries tends to decrease. If the land is neglected, no burning being undertaken, the vegetation reverts to the tall shrub association and the fly population decreases.

Apples, haws and blueberries are all infested by what is supposed to be a single species, known as *R. pomonella*, but individuals reared from blueberries are distinctly smaller in every stage. Small larvae taken from blueberries and placed in ripe apples appeared to feed normally and some pupated, but no adults were obtained. Puparia were also obtained from larvae transferred in the second stage from apple to blueberry, but, although they were normal in size for the apple maggot, no

adults emerged. *R. pomonella* is evidently indigenous to the north-eastern United States, where it infested blueberries, haws and huckleberries (*Gaylussacia baccata*) before the introduction of apples. On the Pacific coast, three species of this genus attack wild berries, *R. symphoricarpi*, Curr. (which has been identified with *R. pomonella* by some authors) [*R.A.E.*, A, xii, 531, 532; xviii, 285] on snowberries, and *R. zephyria*, Snow, and *R. tabellaria*, Fitch, on native whortleberries and blueberries, but apples are free from infestation. It seems probable that the form on blueberry and that on apple exhibit an example of incipient species formation, and the present study seems to confirm the conclusion of other authors that from an ecological point of view these forms are distinct and independent, though no definite morphological basis can be found for differentiating them.

KNOWLTON (G. F.) & JANES (M. J.). **Studies on the Biology of** *Paratrioza cockerelli* **(Sulc).**—*Ann. Ent. Soc. Amer.*, xxiv, no. 2, pp. 283–291, 1 pl., 12 refs. Columbus, Ohio, June 1931.

The literature dealing with *Paratrioza cockerelli*, Sulc (potato Psyllid) is reviewed. During the last three seasons a few areas in Utah have been affected by "yellows" disease [*R.A.E.*, A, xvii, 281] but the potato crop in general has been far less seriously damaged than in 1927. Life-history studies showed that eggs are laid on both surfaces of the leaves, especially young apical ones, along the margins and occasionally on the petioles and stems, either in a row or scattered. In the laboratory 60 females deposited 19,833 eggs. The oviposition period averaged 21·45 days for 58 females, the egg and nymphal ones varied from 3 to 9 and 12 to 21 days respectively. Many infertile eggs are laid; of 9,615 about 73 per cent. hatched. Two or three days after reaching the adult stage and before oviposition begins the colour darkens considerably. In the field, early potatoes began to show "yellows" early in June, and by 20th June the plants were in a serious condition; at this time adults were fairly abundant and examination revealed an average of 456 nymphs to a hill. The generations overlapped during the summer; adults reached their maximum numbers on 27th June and gradually decreased until very few were taken by sweeping with nets during August. The nymphs seek for preference the underside of the leaf, shade being apparently the factor determining their position.

DRIGGERS (B. F.) & PEPPER (B. B.). *Macrocentrus ancylivora* **Rohr. and** *M. delicatus* **Cress. distinct Species.**—*Ann. Ent. Soc. Amer.*, xxiv, no. 2, pp. 293–301, 1 pl., 7 refs. Columbus, Ohio, June 1931.

The following is taken from the authors' summary: The parasite, *Macrocentrus ancylivora*, Rohw., was first reared and described in 1923 from *Ancylis comptana*, Froehl. (strawberry leaf-roller) [*R.A.E.*, A, xii, 55], and was later bred from larvae of the oriental fruit moth [*Cydia molesta*, Busck]. Another species, later identified as *M. delicatus*, Cress., was observed in 1927, and from the same year onwards both species have been found parasitising the larvae of *C. molesta* in New Jersey, there being evidence that *M. delicatus* had previously been attacking this host. Owing to frequent misidentifications and to a

suggestion that these parasites are colour varieties, life-history studies were carried out in 1929–30 and attempts made to cross the two species in 1930. The data obtained indicate that the two species are distinct, and the morphological characters differentiating them are discussed.

HERRICK (G. W.). **The Magnolia Scale** (*Neolecanium cornuparvum* **Thro.**).—*Ann. Ent. Soc. Amer.*, xxiv, no. 2, pp. 302–305, 1 pl., 7 refs. Columbus, Ohio, June 1931.

Most of this information on the biology of *Neolecanium cornuparvum*, Thro, in New York is similar to that already noticed [*R.A.E.*, A, xvii, 379]. Hibernation takes place in the first instar on the newer wood. No males have been observed.

WADLEY (F. M.). **Ecology of** *Toxoptera graminum*, **especially as to Factors affecting Importance in the northern United States.**—*Ann. Ent. Soc. Amer.*, xxiv, no. 2, pp. 325–395, 22 figs., 3 pp. refs. Columbus, Ohio, June 1931.

The unexpected and severe outbreak of *Toxoptera graminum*, Rond., in Minnesota in 1926 led to an investigation of factors governing such outbreaks. A detailed account is given of all the aspects of its bionomics, supplemented throughout with references from the literature and with observations on various factors affecting its distribution, particularly with reference to northern outbreaks.

The following is taken from the author's summary : Extensive studies under controlled temperatures have been carried out for the first time with this species. Development occurred from about 7° C. [44·6° F.] to 33° C. [91·4° F.], being most rapid at about 30° C. [86° F.], and maximum reproduction at about 22° C. [71·6° F.]. It was quickly killed by temperatures as low as about —15° C. [5° F.] or as high as 42° C. [107·6° F.]. At temperatures less extreme but still above or below the range of development, death was slower. Sexual forms were reared only at temperatures averaging below about 22° C. The appearance of winged forms reached a maximum at an average temperature of about 15° C. [59° F.] A wide range of relative humidity had little or no effect on the species. Sexual forms appeared and continued to develop at suitable temperatures, when the days were shorter than 12 hours. The rate of reproduction was much lower with short days, winged forms being more numerous at certain day-lengths. The mechanical action of rain caused a definite reduction in numbers, a snow covering, however, was not fatal. Wind was a stimulus and aid to flight. The injury caused to its food-plants is discussed [*cf.* *R.A.E.*, A, xviii, 162] ; wheat and oats were found unsatisfactory as food after the heading stage. Inadequate food supply tended to stop reproduction and cause a great increase in the winged forms in the succeeding generation, which, however, produced wingless progeny under all conditions. Sex-producing influences must therefore be at work two generations before the sexes mature. Flight depends largely on the wind, and evidence was found of migrations up to several hundred miles in this manner. Developmental rate and reproduction early in adult life are important factors in increase. The population may reach one to several thousand to a square foot before grain is killed.

The natural enemies of this Aphid, which have been discussed elsewhere [xv, 438], included the Coccinellid, *Adalia bipunctata*, L., and the Braconid parasite, *Lysiphlebus testaceipes*, Cress. [*cf.* xv, 2].

T. graminum has done the most damage in the south and border States, especially Oklahoma and Texas. It has been most often injurious in regions where rainfall is sufficient for grain production, but is rather light, with long intervals between rains, during the period of injury to the crop. Summer conditions severely check its activities. Wintering in the egg stage is of little economic importance, owing to the delay in producing migrants in the spring. A large proportion of the outbreaks occur in regions where adults and nymphs are able to hibernate, *i.e.*, where the winter temperature does not often reach 0° F., and averages 30° F. Migration from wintering places to the north appears to occur in many seasons, but usually the infestations by these migrants are too late to become important. The outbreak of 1926 probably originated from migrants from the south-west. Severe northern outbreaks will probably seldom occur, that of 1926 appearing to be the result of a combination of conditions which are not expected often to coincide. Some injury to late sown grain may occur more frequently.

Robinson (W.). **The Thermopile for Temperature Determinations in Entomology.**—*Ann. Ent. Soc. Amer.*, xxiv, no. 2, pp. 417–423, 5 figs. Columbus, Ohio, June 1931.

Detailed instructions are given for the construction and use of the thermopile, which is an adaptation of the principle of the thermocouple [*R.A.E.*, A, xvi, 278] and is employed in the same way as the latter. It has the advantage of producing much greater deflections in the galvanometer, especially when one of ordinary low sensitivity is used, making it possible to detect very small changes in temperature or to read accurately to 0·01 or even to 0·001° C.

Garman (P.) & Schread (J. C.). **Importance of the Sex Ratio in Oriental Fruit Moth Parasite Breeding.**—*Ann. Ent. Soc. Amer.*, xxiv, no. 2, pp. 424–426. Columbus, Ohio, June 1931.

The difficulties encountered in the artificial propagation of parasites are discussed, and it is pointed out that sex ratio is one of the limiting factors in the maintainance of an ever increasing population of parasites in the laboratory. It was observed that the percentage of male individuals of *Trichogramma minutum*, Riley, emerging after exposure for 12 days to a temperature of 38–40° F. was 25, and for 50 days 75. The low percentage of males soon recurs, however, after removal from the refrigerator. In the case of *Macrocentrus ancylivora*, Rohw., the percentage of males varied from 41 for those collected in June and July, to 69 for those reared in September under greenhouse conditions. It seems probable that there is a considerable fluctuation in the normal ratio in the field, for if a change of ratio is so easily produced, there must be a considerable difference in various localities and climates, which may even affect abundance or natural distribution.

[LEBEDEV (F. N.).] **Лебедев (Ф. Н.). Contribution to the Method of Locust Control.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 3–26, 1 fldg. table, 2 refs. Rostov-on-Don, 1930. (With a Summary in German.) [Recd. June 1931.]

In experiments on locust control in northern Caucasus in 1927, the cheapest and most effective poison proved to be sodium arsenite, which can be used for spraying green vegetation. Good results were obtained by moistening cut grass or straw with a solution of this poison, 2 lb. sodium arsenite and 5 gals. water being used for each 50 lb. of grass, or straw, and laying it out in long strips in the path of hoppers. This material can be used again where necessary.

As a contact insecticide, caustic soda in the proportion of 1 lb. to 2½ gals. water is recommended.

[POMERANTZEV (D. V.).] **Померанцев (Д. В.). On the Biology of the Sawflies of the Ash-tree.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 27–32, 4 figs., 5 refs. Rostov-on-Don, 1930. (With a Summary in German.) [Recd. June 1931.]

A brief account is given of the biology of *Tomostethus nigritus*, F., and *Macrophya* (*Pseudomacrophya*) *punctum-album*, L., as observed in the summers of 1927–29 in the Don steppe, where they caused considerable damage to ash (*Fraxinus excelsior*). The adult and larvae of *T. nigritus*, which has not previously been recorded from the Russian Union as a pest of ash, are described. The sawflies are on the wing in early May for 10–12 days. One to three eggs are deposited singly in the chief vein of a very young rolled leaf, and the larvae skeletonise the leaves. They are mature at the beginning of June and descend the trunk to burrow into the soil, where they hibernate in earthen cells at a depth of about 2 ins., pupation taking place in the following spring.

The adults of *M. punctum-album* are on the wing from 16th May till 24th June, and cause severe damage to the leaves. The eggs and larvae are briefly described. Oviposition occurs on the upper surface of the leaves, the eggs being laid singly, or in chains of 2–5, under the epidermis. The larvae hatch in 6–8 days and reach maturity probably in about a month; they cut round holes in the leaves, the main vein and a few lateral ones remaining untouched. Owing to the protracted period over which the adults are found, various stages occur together. There seems to be only one generation a year.

PAPERS NOTICED BY TITLE ONLY.

KISHIDA (H. K.). **On a beneficial Mite** [*Erythraeus ojimai*, sp. n., in Japan] (**Fam. Erythraeidae**) **the natural Enemy of the Paddy Borer,** *Chilo simplex* **Butl.** [*In Japanese.*]—*J. Imp. Agric. Expt. Sta. Tokyo*, i, no. 1, pp. 96–100, 1 pl. Tokyo, March 1929. [Recd. July 1931.]

FAES (H.). **Sur une invasion de grillons domestiques** (*Gryllus domesticus* **L.**) **aux environs de Lausanne.**—*Rev. suisse Zool.*, xxxviii, no. 2, pp. 309–312, 2 pls. Geneva, May 1931. [*Cf. R.A.E.*, A, xviii, 525.]

Blackman (M. W.). **A Revisional Study of the Genus** *Gnathotrichus* **Eichhoff in North America.**—*J. Wash. Acad. Sci.*, xxi, no. 12, pp. 264–276, 18 figs., 18 refs. Baltimore, Md., 19th June 1931.

Takahashi (R.). **Descriptions of some new Formosan Coccidae (Rhynchota).**—*Bull. Ent. Res.*, xxii, pt. 2, pp. 211–220, 9 figs. London, June 1931.

Golding (F. D.). **Further Notes on the Food-plants of Nigerian Insects.**—*Bull. Ent. Res.*, xxii, pt. 2, pp. 221–223. London, June 1931. [*Cf. R.A.E.*, A, xvi, 50.]

Morison (G. D.). **A new Thripid (Thysanoptera) from South Australia.**—*Bull. Ent. Res.*, xxii, pt. 2, pp. 245–248, 3 figs. London, June 1931.

Misra (A. B.). **On the Anatomy of the Larva of** *Laccifer lacca*, **Kerr (Hem. Coccidae).**—*Bull. Ent. Res.*, xxii, pt. 2, pp. 297–306, 6 figs., 18 refs. London, June 1931.

[Chorbadzhiev (P.).] **Чорбаджиев (П.). Report of the Entomological Section for the Year 1927.** [*In Bulgarian.*]—*Rapp. ann. Sta. agron. Etat Sofia, 1927–1928*, pp. 207–246, 6 refs. Sofia, 1930. [Recd. July 1931.] [See *R.A.E.*, A, xviii, 95.]

[Dovnar-Zapol'skiĭ (D. P.).] **Довнар-Запольский (Д. П.). A Review of the Fauna of Sawflies and Horntails (Hym. Chalastogastra) of the North-Caucasian Region.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 33–62, 10 figs., 55 refs. Rostov-on-Don, 1930. (With a Summary in German.) [Recd. June 1931.]

[Rafes (P. M.).] **Рафес (П. М.). Flights of Locust Swarms and Deposits of Locust Egg-pods in the Kuban Region in 1929.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 77–80, 3 maps. Rostov-on-Don, 1930. (With a Summary in German.) [Recd. June 1931.]

[Gavalov (I.).] **Гавалов (И.). On Certain Thysanoptera of the Stavropol Region.** [*In Russian.*] [Notes on distribution and food-plants of 16 species.]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 195–198, 12 refs. Rostov-on-Don, 1930. [Recd. June 1931.]

Morstatt (H.). **Bibliographie der Pflanzenschutzliteratur. Das Jahr 1930.** [A Bibliography of Plant Protection Literature in 1930.]—Imp. 8vo, iv+245 pp. Berlin, P. Parey; J. Springer, 1931. [*Cf. R.A.E.*, A, ix, 445, etc.]

Hall (W. J.). **Observations on the Coccidae of Southern Rhodesia.** [Including 15 new species and varieties and a key to the species of *Ceroplastes.*]—*Trans. Ent. Soc. Lond.*, lxxix, pt. 2, pp. 285–303, 3 refs. London, 10th July 1931. [*Cf. R.A.E.*, A, xviii, 208.]

Schwarz (H.). **Die wichtigeren Feinde der Douglasie in Nordamerika.** [The more important enemies of *Pseudotsuga taxifolia* in North America. Including an annotated list of insect pests.]—*Z. PflKrankh.*, xli, no. 6, pp. 266–268, 4 refs. Stuttgart, 1931.

Laidlaw (W. B. R.). **The Pine-cone Weevil (***Pissodes validirostris***) in Britain; with a brief comparative Account of the Genus** *Pissodes.*—*Scot. Nat.*, no. 189, pp. 79–84, 1 fig., 10 refs. Edinburgh, 1931.

[ZRYAKOVSKIĬ (V. N.).] **Зряковский (В. Н.). On Outbreaks of certain little known Pests in the Tersk Region.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 281–282. Rostov-on-Don, 1930. [Recd. June 1931.]

During recent years the larvae of *Tomostethus nigritus*, F., have caused severe damage to ash (*Fraxinus excelsior*) [*cf. R.A.E.*, A, xix, 559] in a park in the town of Essentuki, northern Caucasus, defoliating an area of about 25–30 acres. Though the adult sawflies were observed on various deciduous trees, eggs were laid exclusively on ash, 1–12 occurring on a leaf. The larvae hatch in about a week and infest the lower surface of the leaves. About the beginning of June they migrate in bands 4–6 ins. wide from the trees that they have defoliated to adjoining ones. Larvae of *Deilephila* (*Celerio*) *lineata* var. *livornica*, Esp., completely stripped an area of over 247 acres of buckwheat [*Fagopyrum esculentum*] in the second half of July, 1930. At the end of the month from 33 to 88 per cent. of them became infected with an unidentified disease.

[MASHKOVICH (L. A.).] **Машкович (Л. А.). On the Biology of the Plum Fruitworm** *Laspeyresia* (*Grapholitha*) *funebrana*, **Tr., under the Conditions of the Sochi Region.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 63–76, 2 figs. Rostov-on-Don, 1930. (With a Summary in German.) [Recd. June 1931.]

Cydia (*Laspeyresia*) *funebrana*, Tr., is an important pest of plums in the district of Sochi on the Black Sea coast, where this fruit is extensively cultivated. Observations carried out in the autumn of 1927 and in the following summer showed that there are three generations a year, which overlap, all stages being present at the same time; the third generation is possibly only a partial one. Eggs, larvae and adults are briefly described. The moths of the overwintered generation emerged about 10th May, those of the first summer one about 20–25th June, and those of the second from 1st August till 1st September. The average duration of the individual stages was 5–6 days for the eggs, 14–17 days for the larvae, 7–8 days for the pupae, and 7–10 days for the adults. In the spring, the females deposited only one egg on each fruit, whereas those of the first and second generations usually laid 2–3 and 4–6 respectively. In the insectary, the total number of eggs laid by a female did not exceed 20, though the ovaries of dissected individuals contained 130–140, of which about one-third were completely developed. The adults do not feed and are unable to fly far; plums growing at a distance of about 210 yards from an infested orchard were not attacked. The injury caused by the larvae is described. Three or four days before pupating they abandon the fruit, whether on the ground or still on the tree. Pupae were only found in cracks under the bark, in cocoons. Only a few larvae of the third generation hibernate, as most of them have not completed development at the time of the gathering of the crop, about the end of August, and remain inside the picked fruit, newly laid eggs being found on plums as late as 1st September. Hibernation takes place under the bark, most of the larvae occurring at a height of about 28 ins. In the autumn of 1927 a considerable percentage of those about to enter hibernation were parasitised by *Pimpla* sp.

The resistance of different varieties of plums to infestation is briefly discussed; it was found that the local variety was immune.

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[Smol'yannikov (V. V.).] **Смольянников (В. В.). Pests of Cotton on the Taman Peninsula.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 81–83. Rostov-on-Don, 1930. (With a Summary in German.) [Recd. June 1931.]

During investigations on the pests and diseases of cotton in the Taman peninsula of the Kuban region, about 40 species of insects have been found damaging the plants. The most important included: the Tenebrionids, *Opatrum sabulosum*, L., *Dasus pusillus*, F., and *Pedinus femoralis*, L., the weevil, *Psalidium maxillosum*, F., and (?) *Agrotis tritici*, L., and *A. nigricans*, L. (neither of which has previously been recorded as a pest of cotton), on the seedlings; *Tetranychus telarius*, L. (*Epitetranychus althaeae*, v. Hanst.), *Aphis gossypii*, Glov., *Loxostege sticticalis*, L., which was very abundant, and *Pyrausta nubilalis*, Hb., which was rare, on the leaves and stems; *A. gossypii*, and *Heliothis* (*Chloridea*) *obsoleta*, F., which appeared in the second half of August and did not cause any serious damage, on the buds, flowers and bolls; and *Pseudococcus* sp. on the roots. Though *Scotogramma trifolii*, Rott., *Calliptamus italicus*, L., *Laphygma exigua*, Hb., *Gryllotalpa gryllotalpa*, L., and *Gryllus desertus*, Pall., which have been recorded as pests of cotton, were present in numbers, they did not infest the crop.

[Zimin (Yu. S.).] **Зимин (Ю. С.). On the Biology of *Euplectrus bicolor* Swed., as a Parasite of Noctuid Larvae.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 99–106, 4 figs., 3 refs. Rostov-on-Don, 1930. (With a Summary in German.) [Recd. June 1931.]

Laboratory observations during August-October on *Euplectrus bicolor*, Swed., which in 1929 parasitised 20 per cent. of the larvae of *Barathra brassicae*, L., as well as those of other Noctuids, in the neighbourhood of Rostov-on-Don, indicate that there are three complete generations a year of this Eulophid, the adults of the last hibernating. The overwintered adults are probably on the wing in the second half of July, those of the first generation at the end of August and beginning September, and those of the second at the end of September. The egg, larval and pupal stages average 4–5, 10–12 and 10–18 days respectively. At room temperature the males lived 1–8 days, and the females 7–68, with an average of 22; at 13° C. [55·4° F.] or below, they lived over four months. In the laboratory *E. bicolor* parasitised various instars of *B. brassicae*, *Phytometra gamma*, L., *Agrotis* sp., *Heliothis* sp., and other Noctuids, whereas none of any other family of Lepidoptera was attacked. The total number of eggs deposited by a female varied from 8 to 46, with an av erage of 27, all usually being laid in one host larva and occasionally in two. Eggs, larvae and pupae are briefly described. It was found that the progeny of fertilised females consisted largely of females, but that a large percentage of females reproduced parthenogenetically, their eggs giving rise to males only. The larva remains during the whole of the feeding period, which lasts 5–6 days, attached by the mouth-parts to one place on the body of the host. About 21 per cent. of those that occur on one host die before feeding is completed. Mature individuals spin under the shrivelled body of the host loose cocoons resembling a net, in which they rest 1–2 days prior to pupation. The adult males emerge 1–2 days before the females. In the laboratory the adults were fed on a weak solution of honey in water.

In one instance an endoparasite, *Microplitis* sp., was reared from a larva of *P. brassicae* that was also parasitised by *E. bicolor*; the larvae of the latter developed normally, but the resulting nine males were only half the usual size.

[ZAKHAROV (L. Z.) & SKALOV (Yu. Yu.).] **Захаров (Л. З.) и Скалов (Ю. Ю.). Strip-mowing and its Application in the Control of the Asiatic Locust under the Conditions of the Reed Beds.** [*In Russian.*] —*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 107–132, 1 pl., 12 figs., 3 refs. Rostov-on-Don, 1930. (With a Summary in German.) [Recd. June 1931.]

In experiments in the control of hoppers of *Locusta migratoria*, L., the value of clearing strips of ground was tested, in the summer of 1929, in the reed beds on the shores of the Sea of Azov. It was found that the hoppers only travel in the clearings when their direction corresponds to that of the band, and concentrate on them when the conditions of light, temperature and humidity are more favourable there than in the surrounding reeds.

The best results were obtained with concentric semi-circular clearings 6–10 ft. apart, connected by passages, prepared in the path of the approaching band. Poison bait which was placed in the clearings was eaten by hoppers as they passed through them, with the result that 98 per cent. of them were killed. Cut reeds sprayed with a poison solution can also be used.

[ROMANOVA (V. P.).] **Романова (В. П.). Parasites (Fam. Ichneumonidae) of injurious Insects in the Northern Caucasus.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 133–138. Rostov-on-Don, 1930. [Recd. June 1931.]

A list is given of 61 Ichneumonids reared during 1925–29 from various pests of cultivated crops in the North Caucasus, showing their distribution, hosts, and dates of collection. Most of the species have not previously been recorded from this region.

[ROMANOVA (V. P.).] **Романова (В. П.). On Pests of Mustard in the Northern Caucasus.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 139–152, 6 figs. Rostov-on-Don, 1930. (With a summary in German.) [Recd. June 1931.]

Mustard, which is an important crop in the northern Caucasus, is often seriously damaged by insects. Observations in the Stavropol and Sal'sk regions during the spring and summer of 1929 showed that over 50 different species are involved. A list of these is given, in many cases with brief notes on their bionomics and the injury caused. *Athalia colibri*, Chr. (*spinarum*, F.), of which sawfly there are three generations a year, is the most important pest, the chief damage being caused by the larvae of the second generation, which are present in July and destroy the flowers. The eggs of the first are laid in the leaves of young plants in the second half of May. The larval stage lasts about 20 days, pupation taking place in cocoons in the soil about the end of June. The adults are

on the wing in the beginning of July, and those of the second generation, which oviposit on wild crucifers, in August. *Pieris daplidice*, L., has 3–4 generations a year, of which the first develops on wild crucifers. At the end of May the adults oviposit on the leaves and buds of early sown mustard, and the resulting larvae pupate at the end of June in cocoons on the plants that they have defoliated ; much injury is caused by the succeeding generation in July. A considerable percentage of the larvae was parasitised by *Anilastus ebeninus*, Grav., and of the pupae by a Chalcid. *Plutella maculipennis*, Curt., also has 3–4 generations a year, which overlap, all stages being present in the field throughout the summer. The larvae of the first generation and some of those of the second infest the lower surface of the leaves, in which they cut round holes, others of the second feeding on the flowers and ovaries ; pupation occurs in transparent cocoons on the leaves and pods. The larvae of the third generation destroy the flowers and pods, pupating on the latter and the shoots. About 16 per cent. of the larvae of the second and third generations were parasitised by *Angitia fenestralis*, Hlmgr., *A. tibialis*, Grav., and *Diadromus subtilicornis*, Grav. The adults of *Colaphellus* (*Colaphus*) *hoefti*, Mén., which is very common, feed on the leaves of sprouting mustard. Eggs are laid at the end of April, chiefly on weeds and occasionally on the leaves of mustard, which the larvae skeletonise. Pupation occurs in the soil at end of May, and the young beetles appear in mid-June. The larvae of *Gastroidea polygoni*, L., which usually develop on *Convolvulus arvensis* and *Polygonum aviculare*, migrate to mustard when these are scarce and sometimes cause serious damage. Pupation occurs in the soil in the second half of June, the adult beetles emerging in July.

Other important pests include : *Carpocoris pudicus*, Poda, which infests the flowers, leaves and pods, being especially abundant in June ; *Eurydema festivum*, L., which has 2–3 generations a year and feeds on the flowers and immature pods ; *Anthrenus scrophulariae*, L., *Adonia variegata*, Goeze, *Lydus syriacus*, L., *L. chalybeus*, Tausch., and *Podonta daghestanica*, Reitt., all of which damage the flowers ; and *Opatrum sabulosum*, L., *Phyllotreta atra*, F., *P. cruciferae*, Goeze, *Chaetocnema tibialis*, Hb., and *C. breviuscula*, F.

Of the insecticides tested, calcium arsenite dust applied between the end of May and the beginning of July at the rate of about 11 lb. to an acre killed 90–100 per cent. in each case of the larvae of *Plutella maculipennis*, *Pieris daplidice* and *Athalia colibri*, being also effective against flea-beetles. Spraying with barium chloride, 1 lb. to 3 gals. water, was effective against the larvae of *A. colibri* and those of *P. maculipennis*, and did not scorch the plants.

[Skalov (Yu. Yu.).] **Скалов (Ю. Ю.).** *Stomatorrhina lunata* **Rd.—Parasite of the Egg-pods of the migratory Locust.** *Locusta migratoria* **L.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 153–154. Rostov-on-Don, 1930. (With a Summary in German.) [Recd. June 1931.]

In the autumn of 1928, egg-pods of *Locusta migratoria*, L., in certain areas of the Kuban Province were found to be parasitised by the larvae of *Stomatorrhina lunata*, F., in the case of one group to the extent of 95 per cent., 3–5 larvae occurring in each egg-pod.

The larvae migrate from one egg-pod to another and pupate in the autumn at a depth of about 2 ins. in the ground. The adults emerge in 10–14 days, and are killed by the first frosts. Oviposition was not observed.

[ARKHANGEL'SKIĬ (N. N.). & ROMANOVA (V. P.).] **Архангельский (Н. Н.) и Романова (В. П.). Pests of Sunflower and Castor in the North Caucasian Region.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 199–216, 8 figs., 1 ref. Rostov-on-Don, 1930. [Recd. June 1931.]

Brief notes are given on the distribution, biology and economic importance of numerous insects found on sunflowers [*Helianthus*] and castor [*Ricinus communis*] in the northern Caucasus in the years 1925–29. *Agapanthia dahli*, Richt., *A. cynarae*, Germ. [*cf. R.A.E.*, A, xix, 6] and *Mordellistena parvula*, Gyll., were the most important pests of sunflowers. The larvae of the last-named mine in the stems, 5–10 occurring in a stem. There is one generation a year. The larvae hibernate in the stubble and pupate in the following April. The adult beetles emerge from about the second half of May till the end of June and oviposit in the stems in August, the larvae hatching in the second half of the month. In 1929, the rate of infestation in some districts reached 96–98 per cent. The immature stages of *Poeciloscytus cognatus*, Fieb., were present in numbers on young plants in the second half of May. Eggs are deposited preferably in the petioles, and the larvae occur in numbers in the second half of July. Soy beans and castor oil plants were also readily attacked. Colonies of *Anuraphis padi*, L. (*helichrysi*, Kalt.) and *Aphis euonymi*, F., were observed on the leaves and chiefly on the discs of sunflowers from mid-May till the harvest, preference being shown for certain varieties. The adults of *Psalidium maxillosum*, F., and the larvae and adults of *Opatrum sabulosum*, L., caused severe damage to young shoots of various oil-producing plants. The larvae of *Amphimallus solstitialis*, L., and *Rhizotrogus aequinoctialis*, Hbst., fed on the roots of sunflowers and castor oil plants, causing the young plants to wither; older ones were retarded in development and produced an inferior crop of seed. Infestation was more severe in fields adjoining waste land and ravines. *Loxostege sticticalis*, L., was very injurious in some districts, and *Heliothis* (*Chloridea*) *dipsacea*, L., which occurred from the second half of June till the end of August, damaged about 25 per cent. of sunflower discs in some localities. Elaterid larvae were very common and injurious to young seedlings.

[ZOLOTAREV (E. Kh.).] **Золотарев (Е. Х.). On the Parasitism by a Red Mite of the Genus** *Eutrombidium* **on** *Locusta migratoria* **L.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 239–242, 1 ref. Rostov-on-Don, 1930. (With a Summary in German.) [Recd. June 1931.]

In 1930 in the Kuban basin, a mite of the genus *Euthrombidium* began to infest the hoppers of *Locusta migratoria*, L., in early June, when the bulk of the latter had reached the 3rd stage. The infestation increased in the later stages, and the adults were often found with hundreds of mites on them. During the moults the mites were not thrown off with the old skin, but crawled from it on to the host. They hibernate in small groups in the soil, not deeper than 4 ins., sometimes within the egg-pods.

[Dobrovol'skiĭ (B. V.).] **Добровольский (Б. В.). A few Deductions from Observations on injurious Insects in fallow grazing Land and Fields.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 273–278, 1 graph. Rostov-on-Don, 1930. (With a Summary in German.) [Recd. June 1931.]

In the course of investigations in the summer of 1930 in one of the western districts of the northern Caucasus, the following pests of cultivated crops were observed in numbers in fallow land: *Epicometis* (*Tropinota*) *hirta*, Poda, *Entomoscelis adonidis*, Pall., *Mesocerus marginatus*, L., *Athalia colibri*, Chr. (*spinarum*, F.), *Loxostege sticticalis*, L., *Heliothis* (*Chloridea*) *dipsacea*, L., *H.* (*Melicleptria*) *scutosa*, Schiff., and *Cassida nebulosa*, L. Brief notes on their seasonal occurrence and on the plants on which they were found are given. It is considered that the proximity of such plots to cultivated fields is more dangerous than grass land.

[Zakharov (L. Z.).] **Захаров (Л. З.). The Soils and Vegetation of the Lands infested with the Egg-pods of the Asiatic Locust in the Region of the Agrakhan Bay in the Daghestan S.S.R.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, p. 279. Rostov-on-Don, 1930. [Recd. June 1931.]

Egg deposits of *Locusta migratoria*, L., were found in a great variety of soils in Daghestan in 1930, a fact that confirms the author's view that this locust is indifferent to soil conditions.

[Zakharov (L. Z.).] **Захаров (Л. З.). On the Pits left by the Asiatic Locust during Oviposition.** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 280–281. Rostov-on-Don, 1930. [Recd. June 1931.]

Numerous empty oviposition holes are often observed in localities where the eggs of *Locusta migratoria*, L., are laid, and the author suggests that this is due to the development of the instinct of oviposition prior to the maturation of the eggs.

[Dobrovol'skiĭ (B. V.).] **Добровольский (Б. В.). Observations on the Cotton Noctuid in the Slavyansk District of the North-Caucasian Region.** (*Chloridea obsoleta* **F.**). [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, p. 283. Rostov-on-Don, 1930. [Recd. June 1931.]

In the course of observations on *Heliothis* (*Chloridea*) *obsoleta*, F., carried out in October 1930 in a cotton-growing district in the northern Caucasus, it was found that this pest chiefly concentrated in fields that had previously been attacked by *Loxostege sticticalis*, L., and in which the bolls had reached maturity earlier than usual owing to the defoliation of the plants. In such fields 74 per cent. of the bolls were damaged as compared with 20 per cent. in those that had not been infested by *L. sticticalis* and in which the plants were healthy, some of them still flowering. *H. obsoleta* was also present on soy beans, the mature larvae feeding externally on the pods and the young ones occurring inside them. Larvae brought into the insectary pupated about 24th October.

[DOBROVOL'SKIĬ (B. V.).] **Добровольский (Б. В.). Notes on the Biology of the southern Sunflower Cerambycid** (*Agapanthia cynarae* **Germ.).** [*In Russian.*]—*Bull. N. Caucas. Pl. Prot. Sta.*, vi–vii, pp. 283–284. Rostov-on-Don, 1930. [Recd. June 1931.]

A brief account is given of further observations on the Lamiid, *Agapanthia cynarae*, Germ. [*cf. R.A.E.*, A, xix, 6] in the summer of 1930 in the Laba district of the northern Caucasus. About the end of May and in June the adults were present in numbers on *Cirsium arvense* and *Carduus nutans* respectively in fields adjoining others containing sunflower stubble and débris left there from the preceding year. Early in June the beetles became abundant on sunflowers, but though the rate of infestation reached 80–100 per cent. in the first half of August, the plants developed normally and the crop could be gathered at the usual time [*cf. loc. cit.*].

LATASTE (F.). **Sur le Criocère du Lis, Col. Chrysomélide. Observations de zooéthique.**—*Bull. Soc. zool. Fr.*, lvi, no. 2, pp. 193–198. Paris, 15th June 1931.

The lily beetle [*Crioceris lilii*, Scop.] has 3 generations a year in France, the adults hibernating. The egg, larval and pupal stages occupy 10, 16 and 20–22 days respectively.

BABEL (A.). **Schädlingsbekämpfung im Spargelbau.** [Control of Pests of Asparagus.]—*Nachr. SchädlBekämpf.*, vi, no. 2, pp. 45–50, 4 figs., 11 refs. Leverkusen, June 1931.

Much loss is caused by diseases and pests to the asparagus crop in Germany, which is valued at over £2,000,000. To prevent oviposition by the asparagus fly, *Platyparea poeciloptera*, Schr., small sticks are stuck in the beds and smeared with an adhesive, or adhesive banding is bound round four sticks surrounding the stems. Spraying or dusting with an arsenical is very effective against the asparagus beetles, *Crioceris asparagi*, L., and *C. duodecimpunctata*, L.

WERNER (W.). **Der Meerrettichblattkäfer** (*Phaedon cochleariae*) **im Gebiet der Freien Stadt Danzig und seine Bekämpfung.** [The Horse-radish Leaf-beetle, *P. cochleariae*, in the Territory of the Free City of Danzig, and its Control.]—*Nachr. SchädlBekämpf.*, vi, no. 2, pp. 51–53, 1 fig. Leverkusen, June 1931.

Phaedon cochleariae, F., has recently become a serious pest of cabbage in the vegetable growing district of Ohra, near Danzig. The over-wintered adults appear in April-May, and there are 2–4 generations a year. The adults, which are very susceptible to cold, wet weather, cut holes in the leaves, the larvae feeding on the lower surface from the edges towards the centre of the leaf. The larval and pupal stages each last 14–17 days. The best means of control was found to be dusting with an arsenical.

GORTER (F. J.). **Aantasting v/d Roembiahpalm** (*Metroxylon sagu* **Rottb.) door rupsen van** *Hidari irava* **Mr.** [The Attack on the Sago Palm by the Caterpillars of *H. irava*.]—*Algem. LandbWkBl. Ned.-Ind.*, xv, no. 46, pp. 1294–1296, 3 figs. Bandoeng, 16th May 1931.

The larvae of the Hesperiid, *Hidari irava*, Moore, injure the leaves of the sago palm, *Metroxylon sagu*, which are commonly used in the Netherlands Indies for thatching roofs. The collection of the larvae is the most effective measure known.

BETREM (J. G.). **Een en ander over de takkenboeboek.** [Some Notes on the Coffee Twig-borer.]—*De Bergcultures*, v, p. 404 (reprint 6 pp.), 2 figs. [? Batavia] 11th April 1931.

In this account of observations on the coffee twig-borers, *Xyleborus morstatti*, Hag., and *X. morigerus*, Bldf., in Java, charts are given showing the relation between these pests and environmental factors and associated insects and fungi. Sunshine, rain and moisture have no direct effect on the beetles. Temperature increases the rate of their development. Rain, however, promotes the growth of the ambrosia fungus that forms the sole food of the larvae, and thus favours the borers. Infestation is therefore slight when there is a low water-content in the twigs, such as occurs in the dry season. At this time, however, injury is more noticeable as the twigs become withered owing to an insufficient supply of water caused by the sealing of the tissues by gum or tylosis as a protective measure by the plant against the fungus.

HAZELHOFF (E. H.). **Onderzoekingen omtrent den witten topboorder.** [Investigations on the White Tip-Borer of Sugar-cane.]—*Arch. Suikerind. Ned.-Ind.*, iii, pp. 361–463, 14 figs., 1 map; also as *Meded. Proefst. Java-Suikerind.*, no. 9. Surabaya, 1931.

The fact that the white tip-borer of sugar-cane [*Scirpophaga intacta*, Sn.] is 4–8 times more injurious to cane in Central Java than in East Java and that one variety of cane is 3–5 times more severely affected than another were traced to a difference in the hardness of the leaf-buds [*R.A.E.*, A, xviii, 703]. All the factors connected with this are surveyed in the present paper, which contains chapters on the amount of infestation in various parts of Java; the injury done; the hardness of the leaf-buds and their content of dry tissue; and the rainfall, sunshine, and evaporation. Differences in infestation in 1929 and 1930 agree with the finding bearing on rainfall and hardness of the leaf-buds. The negative correlation between hardness and infestation is due to the fact that a greater degree of hardness results in a greater mortality of the larvae. The time required for the larval and pupal stages is shorter in young cane with very succulent buds than in old cane with buds containing much dry tissue. A dry wind is directly unfavourable to the larvae and indirectly so by drying the buds. Heavy rain apparently does not affect them, even before they have entered the buds. Rain, however, appears to be injurious to the egg-parasite, *Phanurus beneficiens* var. *elongatus*, Ishida. Where there are many small cane-fields adjoining each other, the moths can easily pass from old to young

cane ; this spread is less marked where the fields are large or separated by forests. Instances are cited from the literature of other insects being adversely affected by hardness in the parts of the plant that they attack [*R.A.E.*, A, xvi, 252, etc.]

Mumford (E. P.). **On the Fauna of the diseased Big-bud of the Black Currant, *Ribes nigrum*, L., with a Note on some Fungous Parasites of the Gall-mite, *Eriophyes ribis* (Westw.) Nal.**—*Marcellia*, xxvii, pt. 1–3, pp. 29–62, 10 figs., 50 refs. Portici, 30th July 1931.

In addition to *Eriophyes ribis*, Nal., eight species of mites and ten species of insects are here recorded as associated with diseased big-buds in the vicinity of Cambridge. These include the Gamasid, *Seius* (*Seiulus*) sp., the Eupodid, *Tydeus foliorum*, Schr., *Chrysopa vulgaris* Schn., the Eulophid, *Tetrastichus eriophyes*, Taylor, and a Syrphid larva, all of which are predacious on *E. ribis* ; the Trombidiid, *Anystis* (*Actineda*) *vitis*, Schr., probably predacious, *Deraeocoris* (*Capsus*) *ruber*, L., possibly predacious, and Coccinellid larvae. Descriptions are given of some of these, with notes on their feeding habits.

Tortrix podana, Scop., has been recorded by Theobald as attacking *E. ribis*. As far as the author is aware, this is the only record of a predacious Tortricid, although there are a number of related genera that occasionally feed on insects. A fungus that appeared to be a new species of *Cladosporium* was found infesting *E. ribis* in diseased big-buds at Cambridge.

Autuori (M.). **Dados biologicos sobre o *Araecerus fasciculatus* (De Geer) (Col. Anthribidae).** [Biological Data on *A. fasciculatus*.]—*Rev. Ent.*, i, no. 1, pp. 52–61, 7 figs., 8 refs. São Paulo, 25th April 1931.

Araecerus fasciculatus, DeG., a pest of coffee in Brazil, oviposits in the berries, only one egg being usually deposited in each. The larva hatches in 6–9 days, feeds between the two seeds for 10–15 and within the seed for a further 25–30. The pupal period lasts 6–9 days. All stages are described. Other plants attacked include cacao, sweet potato, sugar-cane and french beans ; dried fruits are also infested.

Bruner (S. C.). **Informe del departamento de entomologia y fitopatologia, ejercicio de 1929 a 1930.** [Report of the Department of Entomology and Phytopathology for 1929-1930. Experiment Station of Santiago de las Vegas, Cuba.]—Demy 8vo, 74 pp., 14 pls. Santiago de las Vegas, Estac. exper. agron., March 1931.

Brief descriptions are given of the larva, pupa, and adult of the Pyralid, *Maruca testulalis*, Geyer, which bores in the pods of Lima beans [*Phaseolus lunatus*] in Cuba. The eggs are apparently laid in the flowers and young pods, many young larvae being observed in the former. The larvae attack more than one pod, and as a rule only one larva occurs in each. From October to March, the pupal stage lasted 8–12 days, and in February and March captive adults lived for 4–7. In the field pupation in the pods is extremely rare. Infestation begins in September, attains its maximum in November-December, and then decreases owing to natural enemies. Though infestations of 33 per cent. may

occur, the usual figure is considered to be under 15. The Lima bean is the only food-plant of economic importance usually attacked, but infestation occasionally occurs in *Phaseolus vulgaris.*

Three parasites have been observed: the Tachinid, *Argyrophylax albincisa*, Wied., which attacks the larvae, but of which the favourite host is perhaps another Pyralid, *Lamprosema indicata*, F.; and the Braconids, *Apanteles* sp., which is of little importance, and *Microbracon thurberiphagae*, Mues., which is the chief enemy of the borer, about 90 per cent. of all larvae killed by parasites being attributable to it. Spraying with a combination of lead arsenate and Bordeaux mixture, the measure at present in use, is far from satisfactory. Magnesium arsenate, 1 lb. to 50 gals. water, may prove more suitable. Experiments with moist heat and with carbon bisulphide have given good results [*R.A.E.*, A, xviii, 507].

Lima beans are infested by a number of other insects, none of which is of any real importance. They include the Pyralids, *L. indicata*, and *Etiella zinckenella*, Treit., the Tortricids, *Platynota rostrana*, Wlk., and *Amorbia phaseolana*, Busck, the Noctuids, *Prodenia ornithogalli*, Guen., and *Anticarsia* (*Thermesia*) *gemmatalis*, Hb., the Arctiid, *Ecpantheria albicornis*, Gr., *Leptotes* (*Lycaena*) *theonus*, Lucas, the Hesperiid, *Eudamus proteus*, L.; the Rhynchota, *Empoasca fabae*, Harris, *Stictocephala rotundata*, Stål, *Aphis rumicis*, L., *Nezara viridula*, L., and the Tingid, *Corythuca gossypii*, F.; the Galerucid, *Cerotoma ruficornis*, Ol., and the Halticid, *Systena basalis*, Duv.; *Agromyza inaequalis*, Malloch; and the Orthoptera, *Anurogryllus abortivus*, Sauss., and *Turpilia opaca*, Brunn.

Various oil emulsions were tried against *Aleurocanthus woglumi*, Ashby, on *Citrus*, but as injury to the foliage resulted, such sprays should only be used every two months and between November and April. This Aleurodid is checked by the fungi, *Aschersonia aleyrodis* and *Aegerita webberi*, and by the Coccinellid, *Delphastus pusillus*, LeC. The Eulophid, *Eretmocerus serius*, Silv., has been imported from Singapore against it.

A preliminary list is given of insects occurring on citrus in Cuba. They include *Aphis spiraecola*, Patch, on new shoots; *Icerya purchasi*, Mask., first observed in 1926, against which the Coccinellid, *Novius* (*Rodolia*) *cardinalis*, Muls., has been imported from Australia, another useful enemy being the Phorid, *Syneura cocciphila*, Coq.; the Curculionid, *Pachnaeus litus*, Germ., of which the larvae attack the roots, and the adults the leaves and young fruits; and *Atta insularis*, Guér., and *Solenopsis geminata*, F. The pests of coffee dealt with have already been noticed [xvii, 732].

GREENE (C. T.) & URICH (F. W.). **The Immature Stages of** *Pantophthalmus tabaninus*, **Thunberg, with Biological Notes.**—*Trans. Ent. Soc. Lond.*, lxxix, pt. 2, pp. 277–282, 3 pls., 2 refs. London, 10th July 1931.

The immature stages of *Pantophthalmus tabaninus*, Thnb., are described in detail by Greene from specimens collected in Trinidad by Urich, who gives an account of the biology of this fly. The eggs are laid in clusters of 50–100 usually on the sheltered side of dying or recently felled trees, *Erythrina umbrosa*, *Pachira aquatica* and *Ficus* sp. being the food-plants recorded. A total of 465 fully matured eggs and no undeveloped ones were found in a recently emerged female.

The larvae hatch in 13–14 days and seek a suitable hole, generally one vacated by a species of *Xyleborus* or *Platypus*, from which to bore into the wood. The larval stage occupies 4–6 months and the pupal 1–6, including an aestivating period. As healthy trees are not attacked, this fly is probably not of much economic importance.

AUSTIN (M. D.). **Observations on the Hibernation and Spring Oviposition of** *Lygus pratensis* **Linn.**—*Ent. Mon. Mag.*, lxvii, pp. 149–152, 3 figs., 6 refs. London, July 1931.

Though *Lygus pratensis*, L., has been recorded as overwintering both in the adult and egg stages, the author has found that in south-eastern England, only the adults have hibernated (in sheltered rubbish heaps, refuse in and around glasshouses and other similar situations). This is commonly accepted as being the more normal method. Mortality at this stage is high, which may be one reason why this Capsid is not more injurious during the spring to plants of economic importance. Oviposition has been recorded in both the spring and autumn. The adults under observation began egg-laying in early April in the flower buds and flower stalks of groundsel (*Senecio vulgaris*) in preference to currant cuttings. A single egg is laid in the bud, but a greater number may be found, embedded horizontally, in the stem. In an unopened bud the egg is usually inserted at the base. In one locality, where chrysanthemums are infested, there is a cessation in the attack in late July, when the summer (or autumnal) eggs are presumably in the plant tissues, and the fact that infestation is renewed later points to a second generation in the year.

SMEE (C.). **Report of the Entomologist for 1930.**—*Ann. Rep. Dept. Agric. Nyasaland 1930*, pp. 27–31, 5 refs. Zomba [1931].

Myzus persicae, Sulz., was unusually abundant on tobacco in Nyasaland during 1929–30. Usually its parasites and predators are able to hold it in check, but in years when early rain is followed by a spell of dry weather, as was the case during the past and present season, it is able to become abundant before its natural enemies can exert any appreciable influence on its control. Observations conducted during 1930–31 show that nurseries in the open are less liable to become infested than those situated in hot, damp places, surrounded by dense vegetation. Furthermore, it was found that serious damage by this Aphid in the field is only likely to occur if the infestation originates in the nurseries. The use of a nicotine spray is therefore recommended when the plants are in the seedling stage.

Preliminary tests against termites on tea, in which Paris green dust was placed closely round and on the stems, showed that 5 months after treatment, during which time considerable rain had fallen, of 133 treated bushes only 18 per cent. were killed by the pests as against 50 per cent. of the untreated ones. Owing probably to climatic conditions, *Toxoptera aurantii*, Boy., was usually abundant during the season on tea. *Aphis laburni*, Kalt., which is present on green manure plants growing among tea is not a pest of the latter, whereas *T. aurantii*, in addition to coffee, will readily attack nearly all species of *Citrus*.

Antestia faceta, Germ. (*variegata*, Thunb.) caused serious damage to coffee, and some of the infested bushes showed a very pronounced vegetative growth and complete absence of crop, the internodes being abnormally short. The merits of a sweetened bait spray and hand collection in the control of this pest are compared. In general it is considered that hand collection early in the season is probably of as much value as spraying, since a slightly stronger solution than that recommended ($\frac{3}{4}$ oz. sodium arsenite to 4 gals. water) is likely to produce serious scorching, and a large number of beneficial insects, particularly Syrphids, are destroyed, but that spraying should be resorted to if the pests appear to be getting out of hand. In connection with Coccids on coffee, the most interesting record during the year was the presence of a species, probably *Pseudococcus lilacinus*, Ckll., in damp hollows, where the micro-climate might be expected to favour its development. It was attended by the ant, *Pheidole megacephala*, F., but was not widely distributed. A large number of adult cockchafers, mainly of the genera *Trochalus* and *Aserica* (*Autoserica*), and Tenebrionid larvae were collected from the base of coffee bushes a few days after the ground had been flooded in September. The Tenebrionids chiefly consisted of a species of *Zophosis* distinct from *agaboides*, Gerst., and *Dasus* (*Gonocephalum*) *simplex*, F., which composed 57 and 34 per cent. respectively of the total collection of some 400 larvae. European varieties of *Sorghum* were severely injured by a mite similar to red spider whereas native ones remained comparatively free from infestation. The mites and their eggs were attacked by the Coccinellids, *Scymnus* sp. and *S. trepidulus*, Weise, and the larvae of what is perhaps an Agromyzid.

A widely distributed outbreak of *Laphygma exempta*, Wlk. (swarming caterpillar), which was chiefly confined to grasses, some damage being done to young maize, occurred late in 1929 and early in 1930. A list is given of plants found infested by Aphids, including *Aphis laburni*, *Macrosiphum nigrinectaria*, Theo., and ? *M. neavei*, Theo., on *Cajanus indicus*; *A. gossypii*, Glov., and *M. dahliafolii*, Theo., on cotton and weeds; *Aphis* sp. on *Sorghum*; *Macrosiphum* sp. on wheat; *A. leguminosae*, Theo., on Persian lilac; and *Cerataphis lataniae*, Boisd., on *Agave*. Some damage to *Citrus* fruits by the Noctuid, *Egybolis vaillantina*, Stoll. (fruit-piercing moth) was reported from one locality during the early part of the year.

COTTIER (W.). **The Blue Stem-borer of Ragwort** (*Homoeosoma vagella*).—*N.Z. J. Agric.*, xlii, no. 5, pp. 333–337, 2 figs., 3 refs. Wellington, N.Z., 20th May 1931.

An investigation was carried out in the North Island of New Zealand in 1929 to determine the value of *Homoeosoma vagella*, Zell., which according to a footnote by Mr. S. V. Hudson should be known as *H. farinaria*, Turn. (*anaspila*, Meyr.), in the control of ragwort. A brief history of this moth in New Zealand is given, and its characters and larval habits are described. Although it has been reported as doing considerable damage to the weed, it was found that the injury does not extend to the flower-head, so that the seeding capacity of the plant is unimpaired. The economic importance of this moth in this respect is therefore very small, particularly as it has been said to be itself controlled by parasites [*R.A.E.*, A, xvii, 733].

Queensland. Third–Sixth Annual Reports of the Prickly-pear Land Commission for the Years ended 30th June 1927–30th June 1930.—Fol., 4 nos. Brisbane, 1927–1930. [Recd. Sept. 1931.]

These reports deal with the continued success of the biological control of prickly-pear [*Opuntia*] in Queensland [*cf. R.A.E.*, A, xv, 29]. That for 1927 briefly reviews the activities of the Commission since its inception, and they all record the annual progress in the establishment of the insects that are being used against prickly-pear, *viz.*, the cochineal insect [*Dactylopius*], *Chelinidea tabulata*, Burm., and the Pyralid, *Cactoblastis cactorum*, Berg. With regard to the distribution of the eggs of the latter, the following figures are given: October 1927–June 1929 220,606,000, October–November 1929 and February–March 1930 677,111,500, and during the year ending June 1930 802,282,500, making a total since October 1927 of 1,700,000,000 eggs distributed either by the Commission or through material given to landowners. The last report states that no further distributions were made of *Dactylopius* or *C. tabulata*, owing to their natural spread and establishment in all districts.

The present position of the biological control of *Opuntia* must be viewed with the greatest satisfaction, the Pyralid having brought about a degree of destruction, within a few years, that has far exceeded anticipation [*cf.* xix, 287]. Summing up the practical results achieved, the Commission definitely states that not only has the spread of prickly-pear been controlled, but that the area of infestation has considerably decreased during 1930.

King (C. B. R.). **Report of the Entomologist** [for 1930].—*Bull. Tea Res. Inst. Ceylon*, no. 5, pp. 17–20. Kandy [1931].

A study of the life-histories of the Limacodids (nettle grubs) attacking tea in Ceylon, namely, *Narosa conspersa*, Wlk., *Natada nararia*, Moore, *Thosea cervina*, Moore, *T. recta*, Hmps., *T. cana*, Wlk., *Parasa lepida*, Cram., and *Spatulifimbria castaneiceps*, Hmps., showed that in general the life-cycle occupies about 2–3 months. The larvae feed for about 2 months, except those of the first two species, which have a slightly shorter larval stage [*cf. R.A.E.*, A, xix, 137]. Parasites bred from them included species of *Apanteles* and *Rhogas*, an unidentified Tachinid, and *Fornicia ceylonica*, Wlkn., which was formerly supposed to be specific on *Natada*, but was also reared from *T. cervina* and *T. recta*. It appears probable that, in view of the failure to breed the parasites on larvae other than those on which they were found, artificial breeding of indigenous species would not be successful as a measure of control. It is suggested that parasites might be introduced, and a list of those attacking nettle grubs in Java, Ceylon, Celebes and Southern Rhodesia is given. Experiments on artificially propagating the wilt disease, to which nettle grubs readily succumb at certain seasons, by spraying larvae with water in which infected caterpillars had been macerated, were apparently encouraging. Of the various insecticides tested, soft soap appears to be as satisfactory as any and is also the cheapest. The dusts were of no value. Though spraying involves many difficulties, it is the only positive method of control except hand-picking.

The tea tortrix [*Homona coffearia*, Nietn.] only appears to have caused severe damage in a few restricted areas. In connection with the rearing of its parasite, *Trichogramma erosicornis*, Westw., con-

siderable advance was made in the technique of breeding *Ephestia cautella*, Wlk., as the laboratory host. Maize meal gave the quickest return, the life-cycle of the moth at 75° F. being 5 weeks, as compared with 8 in the case of the other foods tested, though the best yield, 130 eggs per female, was obtained with gram meal ; 100 eggs or less were obtained from females reared on maize meal and most of the other materials. Owing to the slow rate of reproduction of the host it was decided not to attempt to rear the maximum amount of parasites but to obtain better strains by bulk selections according to the number of parasitised eggs per female. The improvements secured were not, however, maintained in subsequent generations. The results obtained with eggs of different moths showed that the rate of parasitism of *Ephestia* eggs depended on the size of the parasite, which varied with the size of egg from which it was bred. The difference in the size of the variously bred parasites appears mainly to be centred in the abdomen.

Other pests of tea and green manure plants have been noticed in previous reports [*R.A.E.*, A, xvi, 687 ; xvii, 414].

Betrem (J. G.). **Petroleumzeepemulsies.** [Kerosene-Soap Emulsions.] —*Arch. Koffiecult. Ned.-Ind.*, v, no. 1, pp. 10–21, 1 fig., 8 refs. Surabaya, May 1931. Also as *Meded. Proefst. Malang*, no. 78, 12 pp. Surabaya, 1931. (With Summaries in English.)

Though kerosene emulsion is an excellent insecticide, it cannot easily be detected on the plants, and its action is not lasting, no kerosene being found on foliage 24 hours after application. An account is given of experiments in Java on methods of preparation, including particularly the effect of various kinds of soap on the stability of the stock emulsion and spray and on the insecticidal value of the latter, as a result of which the following recommendations are made : The water should be soft or freed of lime, soft soap of good quality should be used, and the stock solution should be diluted immediately before application. It should be prepared by dissolving 5 lb. soap in 6 gals. boiling water, and mixing in slowly 12 gals. kerosene. The mixture, while still hot (above 50° C. [120° F.]), is pumped through a sprayer with a fine nozzle until a milky stock solution is obtained. This can be kept indefinitely in well-corked jars. For use, it should be well stirred and diluted with 15 parts water.

Lopez (A. W.). **Report of the Entomology Department.**—[*Ann. Rep. Res. Bur. Philipp. Sugar Ass. 1929–30*] pp. 145–172, 5 pls., 5 figs., 6 refs. Manila [1931].

An account is given of work carried out against root-grubs in Occidental Negros, where they are major pests of sugar-cane. The four species dealt with have similar habits. *Leucopholis irrorata*, Chevr. [*R.A.E.*, A, xvii, 107] prefers the lighter soils, though it is found in practically all types. The majority of the adults emerge during May and June. One female is capable of laying at least 38 eggs, which are deposited 8–12 ins. below the surface of the ground. It is concluded from work by S. M. Cendaña that in habitually infested situations with similar soils where fallow land adjoins cane, the former is preferred for oviposition. There are, however, indications that in the absence of fallow land the eggs will be laid in cane fields. The average period of

incubation is 18 days. From May or June to January, February or March, the larvae feed on the roots, seed-pieces or fallen cane, often to a depth of $1\frac{1}{2}$ ft. Pupation occurs 8–20 ins. below the surface of the soil. The females of *Lepidiota* sp., probably *L. pruinosa*, Wied., are capable of laying at least 31 eggs, which hatch in an average of 15·6 days. The larvae are only found in very sandy soils, and the pupal period is passed $1\frac{1}{2}$–$2\frac{1}{2}$ ft. below the surface. The females of *Stephanopholis philippiensis*, Brenske [xix, 417] are capable of laying 40 eggs, which hatch in 19 days. A species of *Lachnosterna* (*Holotrichia*) probably *L. vidua*, Sharp, is also responsible for a large amount of damage, but has been little studied.

These cane grubs are parasitised, to an extent of 27·7 per cent., by the Scoliids, *Campsomeris aureicollis*, Lep., *C. reticulata*, Cam., *C. asiatica*, Sauss., *C. luctuosa*, Smith, *C. annulata*, F., *Scolia manilae*, Ashm., *S. scutellaris*, Gribodo, and *Liacos analis*, F. As the adult parasites feed at the flowers of *Stachytarpheta jamaicensis*, it is recommended that this weed should be sown along the edges of cane fields. They have also been observed on flowers of *Crotalaria saltiana* and *Urena lobata*. Other natural enemies are *Eutrixopsis javana*, Tns., the larvae of which were found on adults of *L. irrorata*; birds and a fungus attacking the larvae; and mites and a worm-like organism destroying the eggs.

Among the control measures discussed are: Hand-collection of the larvae and adults, more than twice the number of gravid females of *L. irrorata* being obtained than in observations by Uichanco [xviii, 651]; cultural measures, including crop rotation with irrigated rice and the avoidance of ratoons; the flooding of infested fields, which should, apparently, be continued for more than 96 hours [*cf.* xviii, 571]; and the planting of less susceptible varieties of cane. Light traps and the application of lime to the soil were found to be of no value. The use of paradichlorobenzene is ineffective under the local conditions of soil and rainfall, and in some cases the larvae were repelled without being killed.

Other pests of sugar-cane in Negros are species of *Anomala* and *Adoretus*, *Argyroploce* (*Olethreutes*) sp., *Oregma lanigera*, Zehnt., *Trionymus sacchari*, Ckll., against which *Cryptolaemus montrouzieri*, Muls., has recently been introduced from Hawaii, and top borers, chiefly *Scirpophaga* (*Topeutis*) *intacta*, Sn.

British Solomon Islands Protectorate. Report on King's Regulation No. 3. of 1931, the Plants and Seeds Control (Amendment) Regulation 1931.—2 pp. typescript. Suva, 5th May 1931.

This Regulation has been issued with a view to the prevention of the introduction into, or spread in, the British Solomon Islands of plant diseases, including insects, the need for it having become apparent when it was discovered that vessels, after loading copra at Samoa, were proceeding to the Protectorate to continue their loading, with the consequent danger of the rhinoceros beetle [*Oryctes*] being introduced into the Group.

Amendments have been made to the principal Regulation (the Plants and Seeds Control Regulation 1929) amongst which is the power given to the High Commissioner to make rules to deal with possible media for the introduction of plant diseases and with such plant diseases as may be discovered in the Protectorate, and also generally for carrying into effect the provisions of the Regulation.

UCHIDA (T.). **Eine neue Art und eine neue Form der Ichneumoniden aus China.** [A new Species and a new Form of ICHNEUMONIDAE from China.]—*Insecta matsum.*, v, no. 4, pp. 157–158. Sapporo, July 1931.

Pimpla (*Epiurus*) *nankingensis*, sp. n., bred from *Rondotia menciana*, Moore, and *Mesochorus facialis* f. *nigristemmaticus*, n., from *Hemerophila atrilineata*, Butl., are described from China.

JU-CH'I LI. **A new Food for laboratory Cultures of** *Drosophila*.—*Peking Nat. Hist. Bull.*, v, pt. 4, pp. 29–31. Peiping, China, June 1931.

A suitable medium for the feeding of *Drosophila* is recommended, in which red sugar, a cheap Chinese product, has been substituted for the commonly used and more costly molasses. The formula on which the flies bred best and most offspring were reared from a single pair was water 75 cc., agar 1·5 gm., corn-meal 10 gm. and red sugar 13·5 cc. It is necessary to add two or three drops of yeast culture, maintained preferably with a little banana water mixture. When seeded with yeast, the food is almost always free from mould.

VANDENBERG (S. R.). **Report of the Entomologist.**—*Rep. Guam Agric. Expt. Sta. 1929*, pp. 16–17. Washington, D.C., February 1931.

The outlook in Guam regarding the establishment in the field of *Pimpla* (*Exeristes*) *roborator*, F., a parasite of the European corn borer [*Pyrausta nubilalis*, Hb.], is not very promising [*cf. R.A.E.*, A, xix, 197]. Thousands of this parasite have been liberated, but only one pupa has been recovered. The reappearance of *Novius cardinalis*, Muls., after an absence of over two years [*cf.* xvii, 48], in the orchard of the Experiment Station coincided with fresh infestations by *Icerya purchasi*, Mask. After effecting complete control of the Coccid, it again disappeared. Neglect of the fields, which became densely covered with weeds and rubbish, was thought to be the cause of the cessation of parasitism of the sugar-cane borer [*Rhabdocnemis obscura*, Boisd.] by *Ceromasia sphenophori*, Villen.

HEINRICH (C.). **Notes on and Descriptions of some American Moths.**—*Proc. U.S. Nat. Mus.*, lxxix, art. 13, no. 2879, 16 pp., 7 pls., 1 fig., 8 refs. Washington, D.C., 1931.

Among the new species dealt with are the Geometrid, *Galenara consimilis* on *Pseudotsuga taxifolia* (Douglas fir) in New Mexico, the Tortricid, *Epinotia opposita* on lucerne and cowpeas in Peru, and the Pyralid, *Diatraea considerata* on sugar-cane in Mexico. *D. busckella* var. *rosa*, n., is described from sugar-cane in Venezuela.

Canadian Forest Insects.—*Spec. Circ. Canada Dept. Agric., Div. For. Insects*, [no. 5] 3 pp., 1 pl. ; [no. 6] 3 pp., 1 pl. Ottawa, March 1931.

These further circulars [*cf. R.A.E.*, A, xix, 123] are by E. B. Watson and M. B. Dunn respectively, the first dealing with *Lygaeonematus erichsoni*, Htg. (larch sawfly) and the second with *Diprion* (*Neodiprion*)

sp. (Jack pine sawfly), all stages of which are described and figured. Large stands of Jack pines [*Pinus banksiana*] have been recently very severely injured in eastern Canada by the latter. The larvae feed on the needles; when abundant they almost defoliate the trees, and if the outbreak continues for 2 or 3 years, kill them. The adults appear in June. The eggs are laid on the needles, one to each needle, and hatch in 15–20 days. The larvae feed in clusters of from 10 to 60, several often occurring on the same needle. During September and early October, they construct cocoons in the moss and under the débris on the ground, emerging as adults in the following year. No practical method for the control of large outbreaks is known, but dusting from aeroplanes will probably prove of great value in checking incipient infestations. Hand-picking or spraying with 1 lb. lead arsenate in 40 gals. water is recommended for small plantations or valuable trees.

The Entomological Branch.—*Rep. Minist. Agric. Canada 1929–30*, pp. 128–150. Ottawa, 1930. [Recd. July 1931.]

An account is given of work carried out in Canada against insect pests during 1929–30. Further liberations of parasites [*R.A.E.*, A, xviii, 118; xix, 123] were made against the European corn borer [*Pyrausta nubilalis*, Hb.], and *Macrocentrus gifuensis*, Ashm., and *Microgaster tibialis*, Nees, have apparently become established at Chatham, Ontario. In addition to *Trichogramma minutum*, Riley, *Macrocentrus ancylivora*, Rohw. [xviii, 494] was liberated against the Oriental peach moth [*Cydia molesta*, Busck], and there are indications of its establishment. Other parasites liberated were *Mesoleius tenthredinis*, Morl., against the larch sawfly [*Lygaeonematus erichsoni*, Htg.], *Compsilura concinnata*, Mg., against the satin moth [*Stilpnotia salicis*, L.], *Blastothrix sericea*, Dalm., against *Lecanium coryli*, L., *Aphelinus mali*, Hald., against the woolly apple aphis [*Eriosoma lanigerum*, Hausm.] and *Digonochaeta setipennis*, Fall., against the earwig [*Forficula auricularia*, L.].

The special problems dealt with at the various field laboratories are outlined.

Back (E. A.). **The Silverfish as a Pest of the Household.**—*Fmrs'. Bull. U.S. Dept. Agric.*, no. 1665, 5 pp., 4 figs. Washington, D.C., June 1931.

This bulletin supersedes previous ones [*R.A.E.*, A, iii, 587; vi, 216]. The increased importance of *Lepisma saccharina*, L., as a household pest in the United States is attributed to the extended practice of evenly distributing the heat throughout houses and to the unusually favourable conditions that often exist in basements. The belief that this insect is introduced with the coal seems to be without foundation. Its bionomics in tropical climates have been previously noticed [xiv, 543]; in a temperate climate 6–10 eggs are laid which, at a temperature of 64–68° F., hatch in 46–60 days. It requires about two years to reach maturity. Additional control measures are a poison bait of sodium fluoride and wheat flour (12 : 100) and a spray of a saturated solution of paradichlorobenzene in carbon tetrachloride. With the latter, which is for quickly exterminating large infestations, better results will be obtained if the room is closed for 24 hours.

Cushman (R. A.). **Descriptions of thirteen new American and Asiatic Ichneumon-flies, with taxonomic Notes.**—*Proc. U.S. Nat. Mus.*, lxxix, art. 14, no. 2880, 16 pp. Washington, D.C., 1931.

Among the new species dealt with are the Ichneumonids, *Calliephialtes nucicola* reared from *Cydia* (*Carpocapsa*) *pomonella*, L., in California and *C. benefactor* from *C.* (*Grapholitha*) *molesta*, Busck, in New Jersey, and the Braconids, *Chelonus pectinophorae*, *Microbracon nigrorufum* and *M. isomera*, all reared from *Platyedra* (*Pectinophora*) *gossypiella*, Saund., in Korea.

Muesebeck (C. F. W.). **Descriptions of a new Genus and eight new Species of Ichneumon-flies, with taxonomic Notes.**—*Proc. U.S. Nat. Mus.*, lxxix, art. 16, no. 2882, 16 pp., 1 fig., 18 refs. Washington, D.C., 1931.

Among the new Braconids described are *Apanteles paralechiae*, reared from the Gelechiid, *Paralechia pinifoliella*, Chamb., *A. depressariae*, from the Oecophorid, *Depressaria heracleana*, L., *A. halisidotae* from cocoons of the Arctiid, *Halisidota maculata*, Harr., *A. cingiliae*, from the Geometrid, *Cingilia catenaria*, Dru., *Microbracon rhyacioniae*, from a Tortricid, *Rhyacionia* sp., on western yellow pine (*Pinus ponderosa*), and *M. cryptorhynchi* from the Curculionid, *Cryptorrhynchus lapathi*, L., all from the United States.

Larson (A. O.). **Pea-weevil Control in the Willamette Valley.**—*Sta. Circ. Oregon Agric. Expt. Sta.*, no. 99, 12 pp., 2 figs., 1 ref. Corvallis, Ore., January 1931.

The pea-growing industry of Oregon is seriously threatened by the increasing activities of *Bruchus* (*Mylabris*) *pisorum*, L. It has only one generation a year. The eggs are laid on the partly developed pods, and the duration of the immature stages varies according to the temperature, adults emerging during harvesting or cleaning or during any warm period afterwards. Those that emerge in the autumn hibernate until the spring, when they feed on pollen and small portions of the leaves or petals. This damage is of little importance compared with that done by the larvae, which eat out most of the food material in the pea. It was found that in isolated fields the percentage of infestation increases directly with the number of successive crops of peas produced. That the adults fly from field to field was shown by the fact that the percentage of infestation in adjoining fields was reasonably uniform irrespective of the numbers of crops produced.

Investigations have shown that, contrary to the general assumption, the seed forms an almost negligible source of infestation [*R.A.E.*, A, xviii, 483]. In autumn, garden peas constitute a serious danger, and those that are being raised for seed should be gathered ripe and immediately fumigated ; peas left on the plants as unfit for use should be destroyed before they ripen, and the plants themselves should be used as fodder or otherwise destroyed. The whole crop should be fumigated immediately after harvest and before it is cleaned, to avoid the spread of infestation from the screenings and from peas awaiting fumigation. The crop should be harvested as early as possible, as the Bruchids develop rapidly in hot weather. This will necessitate planting the peas alone or with early maturing crops. A third source of infestation, and one that appears to have been generally overlooked,

is the presence of infested peas left in the field after harvest. The only method known at present that will eliminate this source is the burning of the straw and stubble.

Brief notes are given on the employment of chloropicrin, hydrocyanic acid gas and carbon bisulphide, all of which are effective fumigants for peas, carbon bisulphide being the most suitable for small scale work on farms.

Pettit (R. H.) & Hutson (R.). **Pests of Apple and Pear in Michigan.**—*Circ. Bull. Michigan Agric. Expt. Sta.*, no. 137, 63 pp., 59 figs. East Lansing, Mich., May 1931.

Notes are given on the bionomics and control of a number of the more common insect pests of pear and apple in Michigan.

Woglum (R. S.), La Follette (J. R.), Landon (W. E.) & Lewis (H. C.). **Handbook of Citrus Insect Control for 1931.**—*Bull. California Fruit Gr. Exch.*, no. 8, 24 pp. Los Angeles, Cal., June 1931.

Detailed reports are presented on the insects attacking *Citrus* during the season 1930–1931 in 11 fruit-growing districts of California and in Arizona, and the control measures employed against them. Infestation by red scale [*Chrysomphalus aurantii*, Mask.], which was the most serious pest of *Citrus* during 1929 and 1930 and continues to be a major pest of lemons, was reduced by extreme measures to a moderate state of control. This scale is rapidly extending its range as a pest of oranges.

Good results, as regards both the control of Coccids and the effects on the trees, were obtained with tank-mixed oil sprays [*R.A.E.*, A, xviii, 481]. The oils of higher viscosity gave results equivalent to those obtained with the commercial emulsions in general use, but light oils of lower viscosity proved somewhat inferior. The principal advantages of tank-mixed sprays are their reduced cost and the fact that the materials do not deteriorate, but more danger is involved with the loose mechanical mixture than with a more stable emulsion in cases of inadequate equipment and supervision.

Cushman (R. A.). **Three new Braconidae parasitic on Bark Beetles.**—*J. Wash. Acad. Sci.*, xxi, no. 13, pp. 301–304, 1 ref. Baltimore, Md., 19th July 1931.

The new Braconids, *Coeloides dendroctoni* from *Dendroctonus monticolae*, Hopk., and possibly from *Ips oregoni*, Eich., *C. scolyti* from *Scolytus* spp., and *Meteorus hypophloei* from the Tenebrionid, *Hypophloeus* sp., are described from the United States. The last is of particular interest since most of the species of *Meteorus* are parasitic on Lepidopterous larvae.

Phipps (C. R.). **Blueberry and Huckleberry Insects.**—*Bull. Maine Agric. Expt. Sta.*, no. 356, pp. 107–232, 10 pls., 3 pp. refs. Orono, Me., December 1930. [Recd. July 1931.]

This paper is based on a five years' study, and is divided into two main parts. The first deals with the insect pests of blueberry (*Vaccinium*) and huckleberry (*Gaylussacia*) in Maine, including also some

records from Massachusetts, and brief notes on factors influencing the abundance of insects in blueberry fields and their relation to pollination. An account is given of the biology and control of the more important pests, among which is a new thrips described by Morgan, *Frankliniella vaccinii*, on *Vaccinium pennsylvanicum*. The second section comprises a catalogue of all insects and mites recorded as occurring on these plants in various parts of the world, indicating their food-plants and distribution and the injury they cause.

DOBROSCKY (I. D.). **Studies on Cranberry False Blossom Disease and its Insect Vector.**—*Contr. Boyce Thompson Inst.*, iii, no. 1, pp. 59–83, 11 figs., 28 refs. Yonkers, N.Y., 1931.

The following is almost entirely taken from the author's summary: False blossom is a serious virus disease of the cultivated American cranberry (*Vaccinium macrocarpon*) in the United States. Attempts to transmit it mechanically or by insects other than *Euscelis striatulus*, Fall., were unsuccessful [*R.A.E.*, A, xvii, 30], but it was transmitted by the latter in experiments conducted in the field in 1926 and 1927, and in the laboratory in 1928 and 1929 [*cf.* xviii, 111, 351]. The adult of this leafhopper is described, and an account is given of its bionomics. It is parasitised by a Dryinid and a Pipunculid. Adults collected on apparently healthy bogs did not transmit the disease, and it was not transmitted by infected leafhoppers to blueberry (*V. corymbosum*). A cytological study revealed no difference between non-infected and infected individuals. It is suggested that to control the disease, measures should be taken to reduce the numbers of *E. striatulus* on the bogs, and that a search should be made for resistant varieties of cranberry.

A list of 44 species of leafhoppers found on cranberry bogs is given.

KUNKEL (L. O.). **Studies on Aster Yellows in some new Host Plants.**—*Contr. Boyce Thompson Inst.*, iii, no. 1, pp. 85–123, 50 figs., 14 refs. Yonkers, N.Y., 1931.

The following is taken from the author's summary: In experiments on the transmission of aster yellows to various plants, *Cicadula sexnotata*, Fall., transferred the disease to 119 new host plants, representing 30 families, a list of which is given. Of these, 15 were families to which the disease had not been previously transmitted. The disease was transmitted to tomato by budding, but was not transmitted mechanically by juice from diseased tissues to any plant. Plants to which the disease was not transmitted after repeated exposures to infected colonies of *C. sexnotata* included tomato, potato, tobacco, peach, celery and *Zinnia elegans*.

SPULER (A.), OVERLEY (F. L.) & GREEN (E. L.). **Oil Sprays for Dormant Use.**—*Bull. Washington Agric. Expt. Sta.*, no. 247, 27 pp., 10 figs., 16 refs. Pullman, Wash., January 1931. [Recd. July 1931.]

The following is largely taken from the authors' summary: Experimental work conducted at Washington for the past 7 years shows that lubricating oil fractions are of value in controlling certain orchard pests

[*cf. R.A.E.*, A, xiii, 83 ; xiv, 270]. Oils ranging in viscosity from 100 to 200 seconds Saybolt have been found satisfactory for dormant spraying and have given nearly 100 per cent. control against *Aspidiotus perniciosus*, Comst. Refinement of oil beyond that of a grade known as red engine oil (unsulphonatable residue 50 per cent.) is not necessary. In experiments on apples in which spraying was begun when the buds were completely dormant and continued at intervals of 3–5 days until after the cluster buds had separated, no injury was obtained from any of the oil emulsions up to the time the buds first showed green. During the critical period, however (which is not always easily defined, since it is largely influenced by temperature, but may be said to exist from the time the buds first show green until the cluster buds separate) considerable injury was obtained with quick-breaking emulsions. Emulsifiers of the oil are not important factors in insect control under field conditions. The size of the dispersed oil droplets and the stability of the oil emulsion produced by the emulsifiers influence the amount of oil that is deposited and retained on the plant. Injury to fruit and leaf buds during the critical period of bud development is proportional to the amount of oil deposited on them.

Miscible oil emulsions at 4 per cent. strength did not generally injure trees even during the critical period. If heavy applications of oils are necessary to control insects, these should be made while the trees are completely dormant.

SPULER (A.), OVERLEY (F. L.) & GREEN (E. L.). **Oil Sprays for Summer Use.**—*Bull. Washington Agric. Expt. Sta.*, no. 252, 39 pp., 8 figs., 10 refs. Pullman, Wash., May 1931.

The following is largely taken from the authors' summary : Oils of low refinement (sulphonation value 50 per cent.) are not suitable for summer use, since they are more or less toxic to plant foliage. Highly refined oils are not toxic to foliage in the sense that leaf tissue is destroyed, but they do under certain conditions interfere with leaf metabolism. The method of refinement, whether by sulphuric acid or by liquid sulphur dioxide, is not important from the standpoint of plant injury. Within certain limits the insecticidal value of an oil increases with its viscosity. The injurious effect of oil on plants also increases with viscosity. Apple trees with heavy loads of fruit that had received six applications of oils of medium (70–75 seconds Saybolt) to heavy (110–120) viscosity showed a reduction in size of the fruit. Three applications of a light oil (viscosity 50–55) controlled red spider, and the fruit on trees receiving these sprays was larger than on those sprayed with lead arsenate. The type of emulsion, whether quick-breaking or more or less stable, is relatively unimportant in summer oil from the standpoint of either insect control or plant injury. The type of emulsion, however, has an important bearing on spray combinations in which oil is used with lead arsenate. The foliage and fruit of trees were badly scorched when certain more stable oil emulsions were used in combination with some brands of lead arsenate that contained a deflocculator, and were instrumental in increasing the water-soluble arsenic. Scorching, however, was prevented when lime or a spreader containing lime was used with oil and lead arsenate combinations. Oil sprays are effective in the control of leafhoppers, Aphids and red spiders of various species and migrating San José

scale [*Aspidiotus perniciosus*, Comst.], but against the codling moth [*Cydia pomonella*, L.] should be combined with either lead arsenate or nicotine sulphate. They will destroy 80–95 per cent. of the eggs of *C. pomonella* and will at the same time improve the spray coverage of the lead arsenate. The combination should be applied at the height of the egg-laying period of both broods, two applications at that time being more effective than three in the first brood cover spray. Lead arsenate should not be used in oil sprays after 15th July, since this combination in late applications makes cleaning of the fruit difficult. Nicotine sulphate and oil sprays have been as effective as lead arsenate (2 lb. per 100 U.S. gals.) in preventing entry into the fruit, when used in any or all the cover sprays, and have been decidedly more effective than lead arsenate in preventing "stings". Oil sprays, particularly those of high viscosity, cause metabolic disturbances in the foliage, which is reflected to a varying extent in decreased size and quality of the fruit.

MACKIE (D. B.). **Observations on Vacuum Fumigation.**—*Mon. Bull. Dept. Agric. California*, xx, no. 5, pp. 299–315, 1 fig., 9 charts. Sacramento, Cal., May 1931.

An account is given of the progress of investigations on the work of vacuum fumigation of stored products, nursery stock, etc., for the destruction of insect pests, particular attention being given to experiments with hydrocyanic acid gas and carbon bisulphide, the physical properties of which are briefly indicated. The various reactions involved and the effect of the gases on, and their diffusion through, the articles fumigated are discussed in detail.

WOODHAMS (G. E.). **Petroleum Oil Sprays on Nursery Stock.**—*Mon. Bull. Dept. Agric. California*, xx, no. 5, pp. 325–330. Sacramento, Cal., May 1931.

This is a general account of petroleum oil sprays, from the point of view of their use on nursery stock. The various terms used in classifying the oils are defined, and their properties, composition, toxicity and effect on the plants are briefly discussed, with notes on their selection for use on various types of plants.

ROARK (R. C.). **Excerpts from Consular Correspondence relating to Insecticidal and Fish-poison Plants.**—39 pp. multigraph. Washington, D.C., U.S. Dept. Agric., Bur. Chemistry & Soils, June 1931.

This is a compilation of the information obtained by the Insecticide Division of the Bureau of Chemistry and Soils in Washington, D.C., concerning the occurrence and use of a wide variety of fish-poisoning and insecticidal plants in tropical countries. An annotated list of such plants is given, their names being arranged alphabetically according to the genus. This work has been taken up in view of the fact that some of the plants contain rotenone, an insecticide more effective than nicotine or lead arsenate and harmless to animals or man. The realisation of these properties of rotenone has stimulated a search for additional plants containing this or other constituents that can be similarly employed.

ESDAILE (P. C.). **Economic Biology for Students of Social Science. Part II. Animal and Vegetable Products.**—Demy 8vo, xv+231 pp., 96 figs. London, Univ. Press Ltd., 1931. Price 10*s*. 6*d*. net.

In the second part of this work [*cf. R.A.E.*, A, xv, 547], dealing with products of animal and vegetable origin, the insects discussed include the warble flies (*Hypoderma* spp.), with notes on the economic losses that they cause in hides and skins, and bees, Coccids and other insects concerned in the production of wax.

SMITH (K. M.). **Virus Diseases of Plants and their Relationship with Insect Vectors.**—*Biol. Reviews*, vi, no. 3, pp. 302–344, 247 refs. Cambridge, July 1931.

The following is taken from the author's summary : A brief survey is made of all the plant virus diseases so far described. They are classified according to the plants they attack, and, where known, the insect vectors of each are enumerated. An analysis is given of the various insect groups concerned in the transmission of plant viruses, and the numerical relationship of each group to virus transmission is shown. Biting insects are associated with only two or three plant viruses ; sucking insects are the vectors of all the others, the numerical relationships being as follows : Thysanoptera, only one authentic case ; Tingids, one case ; Capsids, three ; Jassids and Fulgorids, seven ; Coccids, two or three (most of which need confirmation) ; Aleurodids, one ; and Aphids, 27, the outstanding species, *Myzus persicae*, Sulz., being associated with 14 viruses. The evidence collected indicates that a relationship other than a merely mechanical connection exists between plant virus and insect vector in certain cases. Some further factors in the relationship between virus and insect are discussed, as well as that between the plant and the insect. The conclusion is reached that it is not at the moment possible to correlate feeding methods with ability to transmit virus infection, and that, as a general rule, the virus can be picked up or transmitted by an insect feeding on any part of a plant. Virus concentration does, however, in some cases vary in different parts of the plant, and under these conditions an insect cannot ingest a virus with equal ease from any part of the plant. It has also been shown that it is possible for an infective insect to feed on a susceptible plant without transmitting the virus to that plant. The times required to pick up and to transmit a virus are found to vary from 5 minutes to 6 hours and from 2 minutes to 14 hours respectively. Although the incidence of infection appears to be greatest with large numbers of vectors, a single insect is capable of producing infection and such infection does not differ in severity from that produced by a number of insects.

GRAINGER (J.) & ANGOOD (E.). **The Insect Transmission of Raspberry Mosaic.**—*Proc. Leeds Philos. Lit. Soc.*, Sci. Sect., ii, no. 4, pp. 183–184, 1 pl., 1 fig. Leeds, January 1931.

Experiments carried out with raspberry canes in a greenhouse in Leeds showed that *Aphis rubicola*, Oestl. (*rubiphila*, Patch) is capable of transmitting raspberry mosaic in England.

THORPE (W. H.). **Further Observations on biological Races in** *Hyponomeuta padella* **(L.).**—*J. Linn. Soc.*, Zool., xxxvii, no. 254, pp. 489–492, 2 refs. London, 29th July 1931.

Further experiments [*cf. R.A.E.*, A, xviii, 692] are described, and evidence is brought forward suggesting that the biological race of *Hyponomeuta padellus*, L., on hawthorn (*Crataegus oxyacantha*) and blackthorn (*Prunus spinosa*) is itself split into two less strongly marked subsidiary races, each attached to one of these food-plants.

CLARK (J. E.), MARGARY (I. D.), MARSHALL (R.), CAVE (C. J. P.) & BONACINA (L. C. W.). **Report on the Phenological Observations in the British Isles from December, 1929, to November, 1930. No. 40.** —*Quart. J. R. Met. Soc.*, lvii, no. 241, pp. 345–404, 7 figs. London, 1931. Price 3s.

This report is compiled on similar lines to the previous one [*R.A.E.*, A, xviii, 625].

O'KANE (W. C.), WESTGATE (W. A.), GLOVER (L. C.) & LOWRY (P. R.). **A numerical Rating for the Contact Performance of a Spray Material. Studies of Contact Insecticides III.**—*Tech. Bull. New Hampshire Agric. Expt. Sta.*, no. 46, 8 pp., 2 charts, 1 ref. Durham, N.H., May 1931.

An attempt is made to reduce to a numerical scale the result, as evidenced in spreading, of placing a droplet of a given liquid on a given solid. The size of the sphere represented by the segment constituted by the droplet may be estimated by an examination of its profile, and by measuring its height and its diameter where it makes contact with the solid. The area that a given droplet has been able to cover represents the amount of extension it has been able to achieve. Among several liquids applied to a given solid, their relative wetting performances will be the same as the order in which they stand as indicated by their angles of contact. A mathematical expression is developed by which contact angles may be translated into terms of relative areas, and tables are given from reference to which a definite numerical position can be assigned to any given liquid with reference to any given solid provided that the contact angle made by a droplet of the liquid on the solid is known.

BROOKE (W. M. A.). **Some Observations on the Life-history of** *Arthrocnodax wissmani* **Kieffer (Cecidomyidae : Diptera).**—*Entomologist*, lxiv, no. 819, pp. 180–182, 1 pl. London, August 1931.

In August 1929, larvae of the Cecidomyiid, *Arthrocnodax wissmani*, Kieff., were found feeding on the mite, *Phyllocoptes schlechtendali*, Nal., on the lower surface of apple leaves in London. The eggs are usually laid singly on or among the long hairs on the lower surface of the young leaves, and the larvae are most plentiful on long straight shoots and near the top of the tree. They remain near the hatching place for some days, but in the later instars are very active. They are extremely voracious ; the mites are usually seized at the caudal end, and a full-grown one is sucked dry in 30–45 seconds. About 3 weeks after hatching the larva spins a round or oval cocoon within which it

pupates. In captivity this is spun either in the angle between the veins of a leaf or in a crevice in the cork of a tube. A few midges have emerged each year in from 10 days to a month, during warm spells at the end of August, in September and in October, but the greater number have remained in their cocoons for the winter as larvae to pupate in the following spring or early summer; a few failed to make a cocoon at all. In captivity the adults, which are briefly described, lived only one or two days.

PASSMORE (F. R.). **Depreciation of prepared Copra due to Moulds and Insects.**—*Bull. Imp. Inst.*, xxix, no. 2, pp. 171–180, 5 refs. London, July 1931.

While in nearly all copra there is some depreciation due to insects and moulds, the opinion in the trade is that only in produce from the South Seas is the loss serious enough to warrant biological investigation. In every sample inspected by the author insects or their traces were found, the most prevalent being *Necrobia rufipes*, DeG., *Silvanus* (*Oryzaephilus*) *mercator*, Fauv., and *Tribolium castaneum*, Hbst. Others found were *Carpophilus flavipes*, Murr., *Alphitobius diaperinus*, Panz., *Cathartus* (*Ahasverus*) *advena*, Wltl., *Laemophloeus turcicus*, Grouv., and *Dermestes cadaverinus*, Ol.

TROUVELOT (B.). **Les parasites américains du Doryphore.**—*Rev. Path. vég. Ent. agric.*, xviii, fasc. 5, pp. 170–171. Paris, May 1931.

Of the many insect enemies of *Leptinotarsa decemlineata*, Say (Colorado potato beetle) in North America, the Tachinids, *Doryphorophaga doryphorae*, Riley, and *D. abberrans*, Towns., the Carabid, *Lebia grandis*, Hentz, and the Pentatomid, *Perillus bioculatus*, F., are present in all the infested localities and exercise a certain amount of control. Attempts are being made to introduce the more important parasites into France.

PUSSARD (R.). **Sur la présence en France d'***Aphis forbesi* **Weed.**—*Rev. Path. vég. Ent. agric.*, xviii, fasc. 5, pp. 174–179, 8 refs. Paris, May 1931.

The finding of *Aphis forbesi*, Weed, on strawberries in the Lyons region in 1928 apparently constitutes its first record in Europe. The results of observations on its biology in France are very similar to those obtained in the United States [*cf. R.A.E.*, A, xii, 118; xiii, 432; xiv, 69]. The winter eggs, which are deposited on the petioles and sometimes among the hairs on the lower surface of the leaves, hatch at the end of March, giving rise to young stem mothers. These are protected by ants, particularly *Myrmica scabrinodis*, Nyl., and *Tetramorium caespitum*, L., which in May shelter them in small mounds of earth constructed round the petioles and sometimes round the central crown. The Aphids continue to reproduce parthenogenetically from April to October, when the wingless sexual forms appear. Winged viviparous females occur in the second fortnight in May and migrate to the new strawberry plants. Infested plants become withered. The Trombidiid, *Allothrombium fuliginosum*, Herm., attacks the eggs and stem mothers at the beginning of spring, and later destroys a certain number of the Aphids.

Vayssière (P.). **Apparition en France du** *Megastigmus spermotrophus* **Wachtl, parasite des semences du** *Pseudotsuga Douglasii* **Haar.**—*Rev. Path. vég. Ent. agric.*, xviii, fasc. 5, pp. 180–186, 1 fig. Paris, May 1931.

Unsatisfactory germination of seeds of Douglas fir (*Pseudotsuga taxifolia*) that were imported into France from Austria in December 1930 was found to be due to the presence of *Megastigmus spermotrophus*, Watchl [*R.A.E.*, A, iv, 264 ; xiii, 209]. This Torymid is distributed throughout northern Europe, where it has one generation a year, but had not previously been found in France.

To control *M. spermotrophus*, it has been suggested that the infested seed should be exposed for 5–15 minutes to a temperature of 52–54° C. [125·6–129·2° F.] in the winter, the season when the adults emerge [but *cf*. xv, 108]. Fumigation with carbon bisulphide is recommended as being more satisfactory. A list of other species of *Megastigmus* injurious to seed is given.

Aurivel (P.). **Peut-on détruire facilement et économiquement la courtilière.—Un essai interéssant.**—*Prog. agric. vitic.*, xcvi, no. 28, pp. 35–36. Montpellier, 12th July 1931.

Instructions are given for the preparation and use against mole-crickets [*Gryllotalpa*] of a poison bait of broken rice and zinc phosphide [*R.A.E.*, A, xviii, 45]. Excellent results were obtained with it in France in an experiment conducted in a seed plot in mid-June, over 100 mole-crickets being killed over an area of about 2,150 sq. ft. two days after treatment.

Deshusses (J.) & Deshusses (L.). **Quelques insectes spéciaux nuisibles aux cultures en Suisse romande.**—*C.R. Soc. Phys. Hist. nat. Genève*, xlviii, no. 2, pp. 92–95. Geneva, 1931.

The insect pests from Switzerland recorded include *Phytomyza ilicis*, Curt., on *Ilex aquifolium*, *P. geniculata*, Macq., on *Chrysanthemum* sp., *P. vitalbae*, Kltb., on *Clematis vitalba*, the Cecidomyiid, *Dasyneura* (*Perrisia*) *violae*, Lw., on violet, the Tortricids, *Rhyacionia* (*Evetria*) *buoliana*, Schiff., on *Pinus sylvestris*, *P. austriaca* and *P. sinensis*, and *Argyroploce antiquana*, Hb., on *Stachys affinis* (Chinese artichoke), the Tineid, *Argyresthia conjugella*, Zell., on apple, the Pyralid, *Dioryctria abietella*, Schiff., in cones of *Picea excelsa*, *Abies nordmanniana*, and *Pseudotsuga taxifolia* (*douglasi*), the Geometrid, *Cheimatobia brumata*, L., on lime (*Tilia*) and walnuts (*Juglans* spp.), and the Noctuid, *Brotolomia meticulosa*, L., on geranium (*Pelargonium* sp.).

Candura (G. S.). **Studio sulla tignola del fieno** (*Ptychopoda herbariata* **F.**). [A Study of the Hay Moth, *P. herbariata*.]—*Boll. Lab. Zool. Portici*, xxiv, pp. 233–266, 10 figs., 14 refs. Portici, 8th June 1931.

A detailed account is given of observations on the bionomics of the Geometrid, *Ptychopoda herbariata*, F., in Italy, with notes on its synonymy and descriptions of all stages. The adults occur from April to late October, and oviposit on hay from leguminous plants or other dried plant material, each female laying an average of 100 eggs. The larvae, which hatch in 4–15 days, feed in the hay and pupate there or in

other sheltered places. The larval period varies from 2 months to a year, according to the season and the kind of food available; in the summer it lasted 60 days on camomile and 90 on dried olive leaves. The pupal stage lasts 9–25 days. There are usually two generations a year, with a maximum emergence in May and September. Hibernation occurs in the larval stage, feeding being resumed in the spring. A list of the plants observed to be attacked is given; leguminous ones are preferred, graminaceous plants being the least acceptable. *Hedysarum coronarium*, clover (*Trifolium pratense*), bird's-foot trefoil (*Lotus corniculatus*), and camomile (*Matricaria chamomilla*) are the favourite food-plants, the last-named being severely attacked in the field in the province of Naples. The value of hay is depreciated, as the flowers and leaves are consumed. Dried plants kept for various domestic and pharmaceutical purposes are also destroyed.

Reckendorfer (P.). **Die Ursache des Arsenschadens.** [The Cause of Injury to Plants by Arsenic.]—*Neuheiten Geb. PflSchutzes*, 1931, no. 2, pp. 33–35. Vienna, May 1931.

The amount of lime to be used in combined Bordeaux-arsenical sprays has been studied in Austria. Acid solutions cause scorching after about 14 days. It is therefore necessary to have a slight excess of lime in sprays containing Paris green and lime [*cf. R.A.E.*, A, xix, 182, 243]. When a spray with too little lime dries on the plant, the residue either possesses some free lime, $Ca(OH)_2$, or develops calcium carbonate through the action of the carbon dioxide in the air. Subsequent rain produces hydrolised "water-soluble" arsenious acid, but at first the amount of lime suffices to neutralise this acid. With further rain, however, the lime becomes insufficient for this purpose, and scorching occurs.

Tomaszewski (W.). **Cecidomyiden (Gallmücken) als Grasschädlinge.** [Gall-midges as Grass Pests.]—*Arb. biol. Reichsanst. Land- u. Forstw.*, xix, no. 1, pp. 1–15, 16 figs., 1 pl., 18 refs. Berlin, May 1931.

A list is given of the Cecidomyiids attacking grasses in Europe. Near Stettin, *Poa pratensis* and *P. trivialis* are seriously injured by a species of *Contarinia* [*R.A.E.*, A, xviii, 662]; the larva and adults of both sexes are described. Oviposition usually takes place in the evening or at night. Dissected females were found to contain from 12 to 20 eggs. The author disagrees with von Oettingen's statement that frost is necessary for the insect to complete its development [*loc. cit.*]; larvae collected in July and kept at room temperature produced normal adults in December. Proctotrupids are the chief natural enemies of this Cecidomyiid, others being Empids and spiders. The only measure that appears effective is mowing the grass before the seed ripens, and immediately the flight-period has terminated; 19 days after the main flight-period nearly all the larvae were ready for migration.

Mayetiola phalaris, Barnes, the larva of which is described, infests the stems of *Phalaris arundinacea*, and causes serious injury. Its biology is very similar to that of *M. destructor*, Say.

ANDERSEN (K. T.). **Der linierte Graurüssler oder Blattrandkäfer,** *Sitona lineata* **L.** [The Pea Weevil, *S. lineata*.]—*Monogr. Pflanzenschutz*, no. 6, 88 pp., 40 figs., 5 pp. refs. Berlin, Julius Springer, 1931. Price, paper, *M.* 9.60.

This monograph, which is based on four years' study of *Sitona lineata* L., also collates the work of other authors. This weevil, all stages of which are described, does serious damage to the foliage of leguminous plants in various parts of Germany. Its systematic position, synonymy and distribution in Europe are discussed, and a chapter is devoted to its food-plants. Clovers are avoided if peas, beans, vetches or lucerne (in order of preference) are available, and white clover is preferred to red. The adults emerge from June to September, feed for a time and then hibernate in sheltered situations, but do not mate and oviposit until the following spring and summer. Clover and lucerne are attacked until peas and beans become available, the weevils returning to the former when the latter are harvested. They are active at temperatures between 0·7° C. [33·26° F.] and 42·5° C. [108·5° F.], the optimum being 25° C. [77° F.] and death occurring at 44·3° C. [111·74° F.]. A female may lay over 2,000 eggs, and the average is considered to be about 1,000. In nature most of the eggs are probably laid on the leaves and washed to the ground by rain. The larvae live and pupate in the soil, apparently feeding on the roots and nodules of the plants. The influence of temperature and atmospheric moisture on the egg, larval, and pupal stages is discussed; there seems to be one generation a year in Germany. Chapters are devoted to the natural enemies of the weevil, the factors checking its increase, the injury done and control measures.

MOKRZECKI (Z.). **Ein neues Mittel gegen Xyloterini und Eccoptogastrini.** [A new Method against Scolytids.]—*Anz. Schädlingsk.*, vii, no. 6, pp. 67–68. Berlin, June 1931.

A spray of carbolineum, 5–8 per cent., applied on 15th–18th May 1930, protected trees from attacks by *Xyloterus lineatus*, Ol., and checked existing infestation by preventing the growth of the ambrosia fungus that is the sole food of the larvae ; and a 5 per cent. spray applied to the trunks and branches of apple trees attacked by *Scolytus* (*Eccoptogaster*) *mali*, Bechst., caused the beetles to emerge in a few minutes. They were unable to fly and many died. Felled and barked silver firs (*Abies pectinata*) severely infested by *X. lineatus* and *Xyleborus xylographus*, Say (*saxeseni*, Ratz.) were treated with good results with 0·001 per cent. mercury bichloride, 2 per cent. carbolic acid, 2 per cent. Bordeaux mixture, or 0·1 per cent. Paris green.

KÖRTING (A.). **Ueber die Entwicklung der grauen Gerstenminierfliege** (*Hydrellia griseola* **Fall.**) **bei verschiedener Ernährung.** [The Development of the Barley-mining Fly, *H. griseola*, on different Foods.]—*Z. PflKrankh.*, xli, no. 7, pp. 321–333, 3 graphs, 10 refs. Stuttgart, July 1931.

In observations at Königsberg, Prussia, on the food requirements of the larvae of *Hydrellia griseola*, Fall., and their development on oats and barley, the leaves of these plants bearing the eggs were collected in the field and kept in the laboratory. On hatching, the larva at once enters the leaf. One-day-old larvae refuse a change from the variety of plant on which they have hatched and have begun to feed. The

larval and pupal stages were of shorter duration on barley than on oats ; at 22·7° C. [72·86° F.] they occupied 8 and 7 days respectively on barley and 11 and 8 days on oats. The pupae and adults from oats were smaller than those from barley, and only 42 per cent. of the larvae on oats pupated, as against 100 per cent. of those on barley.

ANDERSEN (K. T.). **Ueber Minderung der Keimfähigkeit und des Ernteertragens an Ackerbohnen bei Bohnenkäferbefall** (*Bruchus rufimanus*). [On the Decrease of germinative Power and Crop Yield in Field Beans infested by *B. rufimanus*.]—*Fortschr. Landw.*, v, pp. 441–442, 1 fig. Vienna, 1930. (Abstract in *Zbl. Bakt.*, (2) lxxxiv, no. 1–7, p. 182. Jena, June 1931.)

The germination of bean seeds [*Vicia faba*] infested with *Bruchus rufimanus*, Boh., is less than that of uninfested seeds, and the resulting plants are distinctly inferior. The seeds should be harvested as early as possible and dried immediately. By storing them for a year the Bruchids, which only live for this length of time, will be killed, since they cannot breed in the warehouse in ripe seeds. In seriously infested districts, the cultivation of leguminous plants should be suspended for a year.

LEISKER (—). **Massenauftreten des Blauen Erlenblattkäfers** (*Agelastica alni*). [An Outbreak of the Alder Leaf-beetle, *A. alni*.]—*Deuts. Forstztg.*, xlv, p. 908, 1930. (Abstract in *Zbl. Bakt.*, (2) lxxxiv, no. 1–7, p. 183. Jena, June 1931.)

The Galerucid, *Agelastica alni*, L., occurred in large numbers on alders in Saxony in 1930, when there were two generations owing to the hot weather in June. The beetles that appeared in April did little harm, but in June the larvae caused almost complete defoliation, being again abundant from mid-July onwards. Collection and burning of infested leaves was the measure adopted.

FALCK (R.). **Scheindestruktion des Holzes durch die Larven von** *Anobium*. **II. Mitt.** [Apparent Destruction of Wood by Larvae of *Anobium*.]—*Cellulosechemie*, xi, pp. 128–129, 1930 ; Beilage zu *Papierfabrikant*, xxviii, 1930. (Abstract in *Zbl. Bakt.*, (2) lxxxiv, no. 1–7, p. 187. Jena, June 1931.)

Examination of the frass of *Anobium punctatum*, DeG. (*striatum*, Ol.) in pine sapwood showed a cellulose loss of almost 9 per cent. As neither sugar nor starch was detectable either in the timber or in the frass of *A. punctatum* or *Hylotrupes bajulus*, L. [*R.A.E.*, A, xix, 461], it is concluded that the larvae of these beetles have a similar chemical action, and only consume cellulose that is not lignified or only slightly so.

RAMBOUSEK (F.). **Schädlinge und Krankheiten der Zuckerrübe im Jahre 1929.** [Pests and Diseases of the Sugar-beet in Czechoslovakia in 1929.]—*Z. Zuckerind. čsl. Repub.*, 1929–30, pp. 433–442, 5 figs. ; also in *Ber. ForschInst. čsl. Zuckerind. Prag*, xxxiv, pp. 15–24, 5 figs. Prague, 1931.

Many of the pests mentioned in this report were recorded in previous ones [*R.A.E.*, A, xiii, 572 ; xv, 168, 316 ; xviii, 295]. Among those of importance in 1929 were the mite, *Tetranychus telarius*, L. (*althaeae*, v.

Hanst.), the Cryptophagid, *Atomaria linearis*, Steph., the Halticid, *Chaetocnema tibialis*, Ill., *Cassida nebulosa*, L., and the weevil, *Bothynoderes punctiventris*, Germ. *Phytometra* (*Plusia*) *gamma*, L., was checked by parasites, *Amblyteles vadatorius*, Ill., being common. This parasite appears to lay only one egg in each Noctuid larva. Some fields were completely defoliated by *Loxostege* (*Phlyctaenodes*) *sticticalis*, L. The beet-fly, *Pegomyia hyoscyami* var. *betae*, Curt., appeared later than usual. At least 90 per cent. of the infestation can be eliminated if the plants are not thinned until oviposition is over ; those uprooted must be removed at once. An outbreak of this pest in June and July was followed by an increase of *Opius nitidulator*, Nees, and *Apanteles congestus*, Nees, which completely controlled it.

Neuwirth (F.). **Grüne Blattläuse auf Rübe.** [Green Aphids on Sugar-beet.]—*Z. Zuckerind. čsl. Repub.*, 1930–31, pp. 41–43, 2 figs. ; also in *Ber. ForschInst. čsl. Zuckerind. Prag*, xxxiv, pp. 87–89, 2 figs. Prague, 1931.

In 1929, sugar-beet in a plot at the Experiment Institute of the Sugar-beet Industry, Prague, was found to be infested by a green Aphid of the genus *Rhopalosiphum*, which is thought to be new. It had apparently migrated from a neighbouring greenhouse. In some experiments it was destroyed by a decoction of horse-chestnuts.

[Chorbadzhiev (P.).] **Чорбаджиев (П.). Report of the Entomological Section for the Year 1928.** [*In Bulgarian.*]—*Rapp. ann. Sta. agron. État Sofia*, 1927–1928, pp. 247–277, 1 ref. Sofia, 1930. [Recd. July 1931.]

Notes are given on some of 212 species of injurious insects observed in different parts of Bulgaria during 1928. Those not mentioned in previous reports [*R.A.E.*, A, xviii, 95, etc.] have been recorded elsewhere [xviii, 225]. *Sitotroga cerealella*, Ol., was the most important pest of stored maize, being also observed in many localities on cobs in the field. The biology and control of *Entomoscelis adonidis*, Pall., which for a number of years has been responsible for heavy losses in the rape crop, are discussed in detail [xvi, 610 ; xvii, 594].

Mokrzecki (Z.). **Monofagizm i polifagizm u owadów, biologicznie związanych z roślinami.** [Monophagy and Polyphagy in Insects that are biologically connected with Plants.]—*Choroby Roślin*, i, pt. 2, pp. 3–10, 16 refs. Warsaw, 1931. (With a Summary in German.)

The author divides phytophagous insects into four groups, and discusses the characters of each. Monophagous and oligophagous habits are considered to be induced by the presence in the plants attacked of certain substances that are indispensable for the nourishment and existence of the insects concerned. Experiments have shown that by abstracting certain acids or other organic substances from a plant, insects that usually breed on it may be compelled to abandon it, whereas others begin readily to feed on it. Furthermore, the rate of infestation depends on the amount of the attractive substance contained in the food-plant ; the larvae of *Ephestia elutella*, Hb., showed a definite preference for better qualities and higher grades of tobacco, which had

a higher content of sugar [*R.A.E.*, A, xix, 383]. The possibility of controlling pests by artificially changing the chemical composition of the sap or tissues of their food-plants is pointed out. A brief account is given of experiments by the author in 1902 and 1905 on the internal treatment of plants against various insects, in which different chemicals were used, and reference is made to the work done in this connection by Müller [xiv, 505].

OBARSKI (J.). **Spostrzezenia nad szkodnikami roślin uprawnych i ozdobnych w latach 1928-1930 na terenach Szkoły Głównej Gosp. Wiejsk. w Skierniewicach.** [Pests of cultivated and ornamental Plants observed in the Years 1928–1930 in the Grounds of the College of Agriculture in Skierniewice, Poland.]—*Choroby Roślin*, i, pt. 2, pp. 14–23, 8 refs. Warsaw, 1931. (With a Summary in German.)

Notes are given on 54 injurious insects, divided according to the plants attacked. *Scolytus* (*Eccoptogaster*) *mali*, Bechst., was present in numbers in the summer of 1930 on apple trees damaged by the severe frosts of the preceding winter, killing many of those that might otherwise have recovered. Spraying the infested trees in June with 15 per cent. carbolineum compelled the beetles to abandon their galleries and drop to the ground ; on healthy trees the same spray proved an excellent repellent. *Anthonomus pomorum*, L., occurred on apples and pears, *Porthetria* (*Lymantria*) *dispar*, L., on plums, *Abraxas grossulariata*, L., on gooseberry, and adults of *Byturus tomentosus*, F., on raspberry. Cabbages were infested by *Barathra brassicae*, L., *Plutella maculipennis*, Curt., and *Pieris brassicae*, L., the last-named being attacked by a number of parasites, of which *Apanteles glomeratus*, L., was the most important. Dusting with Paris green and lime, 5 : 100, proved very effective against both *Pieris* and *Plutella*. In 1930, *Phorbia* (*Hylemyia*) *brassicae*, Bch., destroyed about 10 per cent. of the seedlings of cabbage and 90 per cent. of those of cauliflower, and *Pegomyia hyoscyami* var. *betae*, Curt., was abundant on the leaves of beet in June, damaging about 20 per cent. of young plants. Other injurious pests included *Chlorops taeniopus*, Mg., on cereals ; *Lygus pratensis*, L., *Dolycoris baccarum*, L., and *Euxoa* (*Agrotis*) *segetum*, Schiff., on tobacco ; *Prociphilus* (*Pemphigus*) *nidificus*, Lw., on ash (*Fraxinus excelsior*) ; *Gastroidea viridula*, DeG., on *Rumex alpinus* ; and *Arge rosae*, L., on roses.

CHRZANOWSKI (A.). **Ploniarka-Mucha szwedzka** (*Oscinis frit* **L.**), **jej biologja, szkody zrządzane przez nią w rolnictwie i jej zwalczanie.** [*Oscinella frit*, its Biology, the Damage caused by it in Agriculture, and its Control.]—*Choroby Roślin*, i, pt. 2, pp. 23–55, 1 pl., 9 figs., 17 refs. Warsaw, 1931. (With a Summary in German.)

Oscinella (*Oscinis*) *frit*, L., all stages of which are described, is one of the commonest pests of cereals in Poland, its importance varying in different localities and depending largely on meteorological conditions and the agricultural methods employed. The generations overlap, and there are possibly more than three a year, the life-cycle being completed in 5–7 weeks on an average. The flight periods occur in three waves, which reach their height in the second half of May when the summer crops are tillering, about the end of June when oats and barley are beginning to form grain, and in

the second half of August when the winter crops are coming up. Temperatures ranging from 18 to 30° C. [64·4 to 86° F.] are very favourable for oviposition, no eggs being laid at temperatures below 16° C. [60·8° F.]. The adults may live three months or longer, and as the females continue to oviposit throughout the summer, all stages occur together. Activity ceases at temperatures below 8° C. [46·4° F.] and above 35° C. [95° F.]. Each female lays about 25–35 eggs and possibly more [*cf. R.A.E.*, A, xv, 11], as a number of undeveloped ones were found in the ovaries of dissected individuals. The eggs are deposited singly or in twos, being laid in the spring under the husk protecting the radicle, on the tender shoots close to the soil, or under the leaf sheath, and in the summer on the young panicles of oats or the ears of barley and wheat. The larvae hatch in 3–11 days and bore into the stems; the injury caused by them is described. An infested plant may harbour several dozen larvae, which probably do not leave the plant on which they have hatched [*cf.* xiv, 191; xvii, 700]. The larval stage lasts 3–4 weeks, pupation taking place where the larvae have been feeding, chiefly in the stems and occasionally under the leaf sheath. The adults appear in about 12 days, a temperature of not less than 4° C. [39·2° F.] being essential for their emergence. Pupae of the overwintering generation were sometimes found as early as January.

The economic importance of *O. frit* and the losses caused by it in various parts of Poland are discussed. Of the summer crops, barley suffers the most owing to the protracted period necessary for tillering. The damage caused depends on the age of the plant, injury to the main stem being fatal when it occurs before secondary shoots have been developed; infestation of the latter results in the production of a smaller crop, whereas injury to the side shoots is of no economic importance and when the moisture content of the soil is sufficient may have a favourable effect on the ultimate yield [xviii, 239].

The chief factor regulating the intensity of infestation is the time of sowing. In Poland crops sown at the end of August or beginning of September suffer very severely; those sown after 8th September are slightly infested, and those sown after 15th September are not attacked. In the case of summer crops, late sowings are considerably more infested, and from experiments, sowing in the second half of March is recommended. Quick-growing summer varieties escape infestation. Oats should be cut as early as possible, before the emergence of the adult flies, which will then die in the stacks. Crop-rotation between cereals and root crops is of great value. Methods of ploughing and destroying self-sown cereals, which attract flies unable to oviposit elsewhere before the winter crops appear, are discussed, and the natural enemies of *O. frit* are briefly reviewed from the literature.

[Kirichenko (A.).] **Кириченко (А.). Preliminary Report on controlling the Plum Scale with Lubricating Mineral Oil Emulsions.** [*In Russian.*]—8vo, 71 pp., 51 refs. Odessa, Izd. Sektora S.-Kh. i Khimiz. Odessk. gorodsk. Soveta Osoaviokhima [Agric. Chemic. Sect. Odessa Town Council of Osoaviokhim], 1931. (With a Summary in English.)

Though investigations in other countries have proved the value of oil emulsions against insect pests, they have been little used in the Russian Union. Various emulsions of the local petroleum oils, the chemical composition of which is similar to that of the oils of California and Texas,

were therefore tested in the field in the southern Ukraine and the Moldavian Republic against *Lecanium* (*Sphaerolecanium*) *prunastri*, Boy., and *L. corni*, Bch.

Though these two Coccids have sometimes been confused in the literature, they are distinct both biologically and morphologically. *L. prunastri* only infests stone-fruit trees, especially plums and apricots, whereas *L. corni* also attacks apples and vines, and in the Ukraine is very abundant on *Robinia pseudacacia*, from which it migrates to adjoining orchards. *L. prunastri* is ovoviviparous, the larvae hatching 10–30 seconds after the eggs have been laid. *L. corni* is oviparous and reproduces parthenogenetically, the males being very rare. The total number of eggs deposited by a female of *L. prunastri* averages 330 [but *cf.* xvii, 338], as compared with 2,122 laid by *L. corni*. In the districts studied *L. prunastri* has one generation a year; the overwintered larvae reach maturity in late May or early June. The oviposition period is protracted, the young larvae appearing throughout June and July; under favourable conditions a female lays her eggs in 9–12 days, or in 15–20 at low temperatures. The larvae usually infest the underside of the lower branches and do not migrate to the leaves. Many are killed by the heat in summer or cold in winter. Sixteen species of Chalcids, including several hyperparasites, have been bred from *L. prunastri*; on some of the trees all the adult females were killed by parasites. It is also preyed upon by the larvae of the moth, *Eublemma* (*Anthophila*) *communimacula*, Hb., as well as those of the Coccinellids, *Exochomus quadripustulatus*, L., and *Chilocorus bipustulatus*, L., which latter also attack *L. corni*.

The oviposition period of *L. corni* lasts from mid-May till the end of June, and the eggs hatch in about 6–10 days. Some of the young larvae migrate to the under surface of the leaves, others infest young green shoots, or drop to the ground and attach themselves to grasses. At the end of the summer the larvae congregate on the underside of the lower branches, and sometimes on the trunk. In 1930 over 92 per cent. were killed by the winter cold. In southern Ukraine there is a partial second generation, which develops on thin shoots and hibernates in the egg or larval stage. The rate of parasitism is considerably lower than in the case of *L. prunastri*, only 5 species of parasites having been bred.

The characteristics of various kinds of oil emulsions are discussed from the literature, and an account is given of the physical properties of the nine petroleum oils used in the experiments and of the emulsifying agents and methods of emulsification, which were similar to those commonly employed. The technique of the work is described, and the results of spring and summer applications of emulsions at various strengths are shown in tables. Counts of the living and dead insects on the trees were made according to a method already noticed [xiii, 331]. The results of dormant sprays containing 4 per cent. oil applied in March and April confirmed the view that to secure good control the trees should be treated when the buds begin to swell [xv, 258; xviii, 415]. A mortality approaching 100 per cent. of both Coccids was obtained with four light oil emulsions, whereas a heavy oil was not efficient, and tests with oils of medium viscosity were inconclusive. The treatment did not affect the trees. Spraying of plum trees on 20th July with emulsions containing 2 per cent. of light or heavy oil gave unsatisfactory control and caused much of the foliage to drop. Sprays of $\frac{1}{2}$–$1\frac{1}{2}$ per cent. oil applied on 12th August had no appreciable effect on the Coccids.

[Zhirkov (S. G.).] **Жирков (С. Г.). On the Biology of the May Cockchafer and its Control.** [*In Russian.*]—*Nachr. forsttech. Inst. Kasan,* i, no. 1, pp. 117–134. Kazan, 1931.

Melolontha hippocastani, F., causes severe damage to forests in the Tartar Republic (former Kazan Government). The life-cycle is completed in four years. The adults are on the wing at the end of April and in early May, oviposition taking place about a fortnight after they emerge. Each female lays about 70 eggs in 2 or 3 batches in shady places, chiefly in clay and sandy soils containing humus. In May–June the larvae occur at a depth of 2½–4 ins., in July–August at 4–8 ins. and in September at 8–16. Between May and November the more mature larvae cover an average lateral distance of 16–19 ft. in the soil, provided that there is sufficient moisture and food, so that considerable damage may be done, even if the rate of the infestation is low. The amount of injury caused in various parts of the forest, differing in character and type of vegetation, is discussed. The larvae were chiefly found in low-lying places, and in localities with moderate temperature and humidity and a ground cover of grasses.

The control measures advocated have already been noticed [*R.A.E.*, A, xvii, 341]. In experiments, paradichlorobenzene applied in regularly spaced holes about 3½ ins. deep at the rate of 60, 40 or 20 gm. per sq. metre, the holes nearest the plants being 8 ins. from them, killed 100, 90 and 75 per cent. of the larvae respectively in sandy soil. Similar results were obtained by ploughing clay or sandy soils to a depth of 3½ ins. and applying the material to the furrows at the same rates. This method was found to be simpler and quicker. Increasing the rate of application to 80 gm. per sq. metre affected the development of young trees.

[Dvorzhetzkiĭ (P.).] **Дворжецкий (П.). A few Words on the Hornet.** [*In Russian.*]—*Nachr. forsttech. Inst. Kasan,* i, no. 1, pp. 156–158, 3 figs. Kazan, 1931.

Vespa crabro, L., has caused considerable damage in recent years to birch trees 3–5 years old in the Sviazhsk district of the Tartar Republic (former Kazan Government), withering of the top branches in the spring being due to the hornets feeding on the young bark and cambium at the end of August and early September of the previous year.

[Lyubishchev (A. A.).] **Любищев (А. А.). Contributions to the Methods of estimating Losses caused by Insect Pests** (*Cephus pygmaeus* **L. and** *Harmolita noxiale* **Portsch.**). [*In Russian.*]—*Bull. Pl. Prot.,* i, no. 2, pp. 359–505, 37 figs., 30 tables, 55 refs. Leningrad, 1931. (With a Summary in English.)

The disadvantages of the laboratory method of determining the "coefficient of injury" caused by a given pest [*R.A.E.*, A, xiv, 285] are discussed. In view of the fact that this varies with ecological conditions [xviii, 321], a truer estimate of the losses caused by different pests may be obtained by field methods, which have not as yet been sufficiently studied. To determine the importance of the wheat-stem sawfly, *Cephus pygmaeus,* L., and the jointworm, *Harmolita noxialis,* Porch., a careful analysis of the stems and ears of injured and uninjured spring and winter wheat and a comparison of the weight of the grain

were made in the Samara Government in 1927 and 1928. The results, which are described in detail, and a critical review of the literature show that the economic importance of these species has been overrated. Some of the types of injury that have been attributed to *C. pygmaeus* are considered to be due to such causes as drought, wind, or other pests. In the Samara Government infestation by *C. pygmaeus* only results in a loss of 6–10 per cent. of the weight of the grain. The presence of *H. noxialis* in the stem of the plant has no effect on its development or on the weight of the grain [*cf.* xvi, 666].

[PUZANOVA-MALUISHEVA (E. V.).] **Пузанова-Малышева (Е. В.). On the Habits of *Eurytoma amygdali* End., a Pest of Plums.** [*In Russian.*]—*Rev. russe Ent.*, xxiv, no. 3–4, pp. 166–178, 13 figs., 17 refs. Moscow, 1930. (With a Summary in English.) [Recd. August 1931.]

Eurytoma amygdali, End., which has been recorded as a pest of almonds, apricots and plums in southern Russia, Bulgaria and Syria, causes considerable damage to plums in the Kursk Government (Central Russia), and observations on its biology were made there in 1928. All stages are described. The mature larvae hibernate inside the stones of fallen plums, pupating in them either in the following May or after a lapse of two or even three years. The pupal stage lasts 13–16 days. To make its way out, the young adult gnaws a hole in the wall of the stone and through the fruit, which takes 3–6 days, some individuals dying in the process. The emergence of the adults coincides with the flowering of plum trees and lasts about 3½ weeks. They are on the wing for 5–6 weeks, and eggs are laid inside the young kernels, being often deposited in one that is already infested. About 150 fully developed eggs were found in the ovaries of dissected females. In the insectary unfertilised females oviposited, and some of the adults lived 3–4 weeks. The larvae hatch in 16–19 days, and after feeding within the stone for about 7 weeks enter aestivation, which passes into hibernation ; only one larva in each fruit survives. The infested fruits usually fall prematurely, but in some cases they remain on the tree till the larvae have matured.

The collection and destruction of fallen fruits, or deep digging in the autumn in order to bury the infested fruit and prevent the emergence of the adults, are recommended for control. A larva of *Mesochorus nigripes*, Ratz., and a pupa of *Ascogaster* sp., both in cocoons, and *Syntomaspis* sp. were found in stones infested with *E. amygdali*.

[GERASIMOV (A. M.).] **Герасимов (А. М.).** *Euzophera bigella* **Zell., ennemi du pommier en Asie Centrale.** [*In Russian.*]—*Rev. russe Ent.*, xxiv, no. 3–4, pp. 179–181, 3 figs. Moscow, 1930. [Recd. August 1931.]

In the Bokhara region of Uzbekistan the larvae of *Euzophera* (*Ephestia*) *bigella*, Zell., are often responsible for serious damage to apples erroneously attributed to *Cydia pomonella*, L. In the summer of 1928 about 70–80 per cent. of the apples taken from an orchard believed to be heavily infested with *C. pomonella* contained larvae of *E. bigella*, several individuals occurring in a fruit. Descriptions are given of the adult moth and the genitalia of both sexes. The moths are on the wing at the end of August, and the species is widely distributed in Europe, Transcaucasia, Central Asia and the Far East.

[CHESNOKOV (P. G.).] **Чесноков (П. Г.). Ueber** *Harmolita eremita* **Portsch. im Gouvernement Samara nebst einer Uebersicht der anderen an Gräsern.** [*H. eremita* in the Samara Government and a Review of other Species of Jointworms occurring on Gramineae.] [*In Russian.*]—*Rev. russe Ent.*, xxiv, no. 3–4, pp. 182–193, 2 figs., 10 refs. Moscow, 1930. (With a Summary in German.) [Recd. August 1931.]

Following a heavy infestation of rye by *Harmolita eremita*, Porch., and *H. eremita* var. *nodalis*. Rim.-Kors., in the Samara Government in the summer of 1925, a study of their biology was carried out to determine whether the destruction of the stubble or of the straw is the more effective remedial measure. The larvae of *H. eremita* invariably occurred in the lower part of the stem, up to a height of about 8 ins. from the ground, whereas those of *H. eremita* var. *nodalis* infested the upper internodes. Observations showed this to be due to the fact that the adults of the latter emerge 15–20 days later than those of the former and oviposit in the upper internodes, the lower part of the stem being then too advanced for this. The eggs are laid singly, one to each stem, and hatch in 10 days. Parthenogenesis was observed in the case of *H. eremita* var. *nodalis*. As the larvae of this variety are readily attacked by *Homoporus vassilievi*, Ashm., the rate of parasitism amounting to 45–60 per cent. as compared with 8–10 per cent. in the case of those of *H. eremita*, the author believes that the stubble is the chief source of infestation. This is confirmed by the fact that infestation was always higher on those sides of a field that adjoined plots under stubble. Furthermore, rye that was growing near a place where straw was heaped up was only infested to the extent of 5–6 per cent., as compared with 20–30 per cent. in fields adjoining stubble. In the autumn of 1927 numerous larvae of both forms were destroyed by *Pediculoides ventricosus*, Newp.

Other species of *Harmolita* found in the Samara Government included : *H. noxialis*, Porch., which in one district infested 15 per cent. of winter rye in 1926 and 25 per cent. of summer wheat in 1927, being also very abundant on *Agropyrum* spp. ; *H. rossica*, Rim.-Kors., and *H. inquilina*, Rim.-Kors., on rye and *A. repens* ; *H. maxima* Hed., on *Calamagrostis epigeios* ; *H. aciculata*, Hed., on *Stipa capillata* ; and *H. samarica*, sp. n., the female of which is described, causing galls on *Bromus inermis*.

[ZORIN (P.V.).] **Зорин (П. В.). Sur la biologie du** *Microgaster marginatus* **Nees (Hymenoptera).** [*In Russian.*]—*Rev. russe Ent.*, xxiv, no. 3–4, pp. 220–224, 15 figs., 2 refs. Moscow, 1930. [Recd. August 1931.]

Laboratory observations on *Microgaster marginatus*, Nees, in the Leningrad Government, where this Braconid is the chief parasite of *Polia suasa*, Schiff., and *P. oleracea*, L. [*cf. R.A.E.*, A, xvii, 588], showed that there is one generation a year. One or occasionally two eggs are deposited in the very young larvae of *P. oleracea* a few hours before they hatch. The ovaries of females captured in the field during the oviposition period usually contained 550–600 fully matured eggs, besides a number of undeveloped ones, and females bred in the laboratory had as many as 1,000 eggs two weeks after emergence. This indicates that each female is capable of attacking all the eggs of

several batches ; the rate of parasitism, however, is always below 100 per cent., though usually above 50. The larvae hatch in 6–7 days and pass through three instars, which are described. At 20° C. [68° F.] and a humidity of 50 per cent. they matured in 20–23 days, and at 27–28° C. [80·6–82·4° F.] in about 16. The parasitised host larvae spin cocoons in the soil just before the parasites emerge from them. After this, however, they return to the surface and die. The parasites hibernate in the larval stage in cocoons in those of their hosts and then pupate.

To obtain adults in the laboratory it is necessary to keep the cocoons for a certain time at a temperature below freezing point and then transfer them into a warm place ; cocoons kept in January at 25° C. [77° F.] gave rise to adults in a month. It is possible to preserve the cocoons in a cool place for a period of about two years. In view of the ease with which this parasite can be bred in the laboratory, it is recommended to rear it for liberation in the field. It also attacked the eggs of *P. thalassina*, Rott., but did not parasitise those of *P. pisi*, L., *Barathra brassicae*, L., or *Agrotis occulta*, L.

[FEDOROV (S. M.).] **Федоров (С. М.). Insectes nuisibles dans les forêts de la Crimée.** [*In Russian.*]—*Rev. russe Ent.*, xxiv, no. 3–4, pp. 225–229, 1 ref. Moscow, 1930. [Recd. August 1931.]

A list is given of 39 insect pests occurring in the forests of southern Crimea, based on the author's own observations and records from the literature, with brief notes on their seasonal occurrence, economic importance and local distribution. They include *Myelophilus* (*Blastophagus*) *minor*, Htg., *M.* (*B.*) *piniperda*, L., *Ips sexdentatus*, Börn., *Rhyacionia* (*Evetria*) *buoliana*, Schiff., *R.* (*E.*) *resinella*, L., and *Leucodiaspis* (*Leucaspis*) *pusilla*, Lw., on pines ; *Rhynchaenus* (*Orchestes*) *fagi*, L., on beeches ; and *Phylloxera coccinea*, Heyd., *Tortrix viridana*, L., *R.* (*O.*) *pilosus*, F., *R.* (*O.*) *quercus*, L., *Cerambyx cerdo acuminatus*, Motsch., *Zeuzera pyrina*, L., *Xyleborus* (*Anisandrus*) *dispar*, F., and *Porthetria dispar*, L., on oaks. Outbreaks of *P. dispar* are checked by a disease similar to flacherie and by various parasites, *Apanteles fulvipes*, Hal., and *A. solitarius*, Ratz., being the most active.

GERASIMOV (A.). **Zur Lepidopterenfauna von Mittelasien iii. Neue** *Lithocolletis.*—*Ent. Z.*, xlv, no. 9, pp. 125–132, 5 figs. Frankfurt a. M., 8th August 1931.

New species of *Lithocolletis* recorded from Central Asia include *L. malella* on apple.

SICARD (A.). **Descriptions d'espèces nouvelles appartenant à la famille des Coccinellides (Col.).**—*Ann. Mag. Nat. Hist.*, (10) viii, no. 45, pp. 228–234. London, September 1931.

Among the new species described are *Rodolia obscuricollis* predacious on *Steatococcus* (*Icerya*) *euphorbiae*, Brain, in Cape Province, *Scymnus ancoralis* on *Pseudococcus citri*, Risso, in Kenya, and *S. ardosiacus* on *Aspidiotus destructor*, Sign., in the Gold Coast.

PAGLIANO (T.) & SÉGUÉLA (J.). **Comportement du** *Pachytychius avulsus* **Faust (Charançon nuisible aux grains de blé immatures) au Service Botanique et à l'Ecole Coloniale d'Agriculture de Tunis.**—*Ann. Serv. bot. Tunisie*, vi (1929), pp. 175–186, 3 pls. Tunis, 1930. [Recd. July 1931.]

An account is given of cage observations carried out in 1928 and 1929 in Tunis on the biology of *Pachytychius avulsus*, Faust, the larvae of which cause considerable damage to cereals, especially wheat. This weevil is very common in northern Africa, having one generation a year in Tunisia. The egg, larva and adult are described. Young weevils usually emerge from overwintered pupae in the second half of April, and oviposit on the immature ears of wheat, usually 2–3 and sometimes 8–10 eggs being laid on one ear. The oviposition period lasts about a month, the total number of eggs laid by a female varying from 60 to 80. The larvae hatch in 2–5 days and penetrate into the soft grain, which they hollow out, filling it with frass and excreta ; a larva usually destroys one grain only. The feeding period lasts till the end of May or beginning of June, when the larvae eat out exit-holes in the grains and drop to the ground, into which they burrow. If the soil is dry and hard, pupation occurs close to the surface, in which case the adults emerge in the first half of April ; but if it is sufficiently moist and friable, the larvae are able to penetrate up to 20 ins. deep and give rise to adults at the beginning of May.

As the weevils cannot fly but have to move over the ground in search of food-plants, when they are easily destroyed by birds and other predators, they may be controlled by crop rotation and sowing wheat at some distance from the fields of the preceding year. As the larvae can develop in young ears only, early or late maturing varieties of wheat which at the time of the oviposition would be either too advanced in growth or in the flowering stage, might be used. However, so much depends on the time of emergence of the weevils from various depths in the soil, that the carrying out of this suggestion would be difficult in practice.

WIDIEZ (M.). **La culture du cotonnier en Afrique du Nord.**—*Agric. prat. Pays chauds*, ii, no. 13, pp. 503–519, 8 figs., 5 refs. Paris, July 1931.

Earias insulana, Boisd., which up to the present has been the principal pest of cotton in French North Africa, appears to have completely disappeared during the past two years from cotton plantations in Algeria, owing probably to the activities of its native parasites. Its bionomics and control, and the injury it causes, are discussed from the literature. Towards the end of March 1930 larvae similar to and very probably those of *Platyedra* (*Gelechia*) *gossypiella*, Saund., which is widely distributed throughout Algeria [*R.A.E.*, A, xix, 188], were found infesting cotton seed in several localities in the region of Oran, and for the past two years planters seem to have mistaken the larvae for those of *Earias*. The characters distinguishing them and the differences in the injury they cause are discussed. The control measures employed against *P. gossypiella* in other countries are reviewed.

Other pests of cotton in Algeria are *Aphis gossypii*, Glov., *Oxycarenus hyalinipennis*, Costa, the beetles, *Elater* sp. and *Rhizotrogus* sp., *Prodenia litura*, F. (*littoralis*, Boisd.), and *Heliothis obsoleta*, F.

RÉGNIER (P.), LESPES (L.) & RUNGS (C.). **Sur l'habitat de *Schistocerca gregaria* Forsk. et la succession des générations chez cette espèce.**—*C.R. Acad. Sci. Fr.*, cxcii, no. 23, pp. 1485–1487. Paris, 1931.

In African territories west of the meridian of Greenwich, the distribution of *Schistocerca gregaria*, Forsk., is limited in the South by 12° N. Lat.; between this parallel and 21° N. Lat. it occurs together with *Locusta migratoria migratorioides*, R. & F., and *Anacridium moestum*, Serv.

According to reports on breeding in the autumn and winter of 1930, received from different parts of French West Africa, and to breeding experiments in the summer [*R.A.E.*, A, xix, 55] and winter, it appears that the annual cycle of *S. gregaria* (phases *gregaria*, *congregans* and *dissocians*) in West Africa consists of a summer and a winter generation, the latter occupying a longer period and including a diapause in the adult stage. In Morocco the migration of the summer generation is from North to South, and of the winter one in the reverse direction.

COUTINHO SARAIVA (A.). **Papel da fumigação na economia citrícola.** [The Rôle of Fumigation in the Economics of Citrus Culture.]—*Bol. agríc. e pecuário, Moçambique*, 1930, no. 3–4, pp. 47–55, 2 figs. Lourenço Marques, 1931.

This is a popular article on the fumigation of *Citrus* trees in Mozambique with hydrocyanic acid gas against Coccids. The species found in the colony are *Chrysomphalus* (*Aspidiotus*) *aurantii*, Mask., *C. ficus*, Ashm., *Lepidosaphes beckii*, Newm. (*Mytilaspis citricola*, Pack.), *L.* (*M.*) *gloveri*, Pack., *Coccus* (*Lecanium*) *hesperidum*, L., and *Saissetia* (*L.*) *nigra*, Nietn.

FRAPPA (C.). **Sur deux insectes hémiptères nuisibles au caféier à Madagascar.**—*Agron. colon.*, no. 162, pp. 166–167. Paris, June 1931.

Two insect pests of coffee in Madagascar that have not previously been recorded are the Tingid, *Galeatus involutus*, Drake, and the Pentatomid, *Antestia clymeneis*, Kirk. The former is found at the beginning of the rainy season (October–November) and lives on the lower surface of the leaves, which become yellow and dry as the result of many punctures and finally fall. Young trees are the most frequently attacked; they become unhealthy, cease to produce flowers and finally die. An insecticide that gave good results against this insect consists of 50 lb. of débris of dry tobacco leaves steeped for 48 hours in 100 gals. of water and filtered through muslin, to which is added just before use 1 gal. methylated spirit, 8 lb. soap and 2 lb. sodium carbonate.

A. clymeneis punctures the flower peduncles and the berries, causing the destruction or premature drying of the fruit.

A Short Account of the Work of the Indian Lac Research Institute.—Fol., 23 pp. Nankum, Ranchi. [February 1930.]

Entomological.—*Rep. Comm. Dir. Indian Lac Res. Inst. Nankum, Ranchi*, 1928–29, pp. 25–30; 1929–30, pp. 27–50. Calcutta, 1929–30.

In all three papers detailed accounts are given of the bionomics of *Laccifer* (*Tachardia*) *lacca*, Kerr, and of investigations on its parasites,

predators and those insects beneficial to it [*R.A.E.*, A, xviii, 385, 638; xix, 25], and the first one contains a general account of the technique of lac cultivation. There are certain disadvantages to the method of forecasting "swarming" (emergence of larvae from brood lac) by ovular development [*cf.* x, 181], and a new method is being worked out by which emergence can be foretold by means of the yellow spot appearing on the female test a few days prior to swarming. The effect of temperature on swarming and methods of inducing it artificially are discussed.

Insect enemies cause severe loss annually and the general adoption of the following control measures would help in its reduction: the use of uninfested lac for brood purposes, the avoidance of self-inoculation, and the removal of all broods preferably 3 weeks or at the most 4 weeks after inoculation. The crop, exclusive of that to be used for inoculation, and all brood lac after removal from the tree, should be fumigated with carbon bisulphide at the rate of 1 oz. to 10 cu. ft., or immersed in water for 8–14 hours and dried in hot sand or in the air.

NORRIS (D.), BATES (H. T.) & RANGASWAMI (M.). **A preliminary Note on the Use of *Acacia catechu* (Khair) as a Host alternative with *Schleichera trijuga* (Kusum) for the Cultivation of *Tachardia lacca* (Lac).**—*Ind. For.*, lvi, no. 1, pp. 5–14, 8 pls. Allahabad, January 1930. [Recd. July 1931.]

The following is taken from the authors' summary: *Acacia catechu* has proved to be an excellent food-plant for *Laccifer* (*Tachardia*) *lacca*, Kerr, in the Ranchi district of India owing to its ready germination, rapid growth and satisfactory response to pruning. Also the brood lac obtained from it alternates well with that from *Schleichera trijuga* and the resulting lac, which is pale in colour, fetches the same price in local markets as that derived purely from *Schleichera*. Incrustations are of good quality, though as the lac is brittle, it is advisable to lace the branches into the tree rather than tie them when infecting. So far the yields resulting from trials have been very satisfactory. Using the alternation of broods, it has only been possible to produce one good crop a year with *A. catechu*, which does not produce shoots suitable for the February inoculation.

DAVIDSON (J.). **The Influence of Temperature on the Incubation Period of the Eggs of *Sminthurus viridis* L. (Collembola).**—*Aust. J. Exptl. Biol. Med. Sci.*, viii, pt. 2, pp. 143–152, 1 graph, 5 refs. Adelaide, 16th June 1931.

Experiments, of which the technique is described, have been made on the influence of temperature on the incubation period of the eggs of *Smynthurus viridis*, L., when ample soil moisture is available. The results of tests on 77 batches of eggs show the critical cold point to be 5·5° C. [42° F.]. The optimum temperature for incubation appeared to be between 18 and 26° C. [64·4 and 78·8° F.]. At temperatures above 26·7° C. [80° F.] development was retarded, doubtless in association with variable moisture conditions, and only a few individuals hatched out.

Gourlay (E. S.). **Parasites of the Subterranean Grass-caterpillar.**—*N.Z. J. Sci. Tech.*, xii, no. 6, pp. 361–362, 7 figs. Wellington, N.Z., June 1931.

Hepialids of the genus *Porina* cause extensive damage to lawns and pasture land in New Zealand. In mature larvae of one of the species, *P. despecta*, Wlk., two indigenous Tachinids, *Hystricia lupina*, Swed., and *Phorocera clathrata*, Now., have been found. *Phorocera* is comparatively rare, but 20–25 per cent. of the host larvae are destroyed by *Hystricia*. Adults of the latter are present during October and November in the proportions of approximately one male to four females. There are indications that the females live for at least two months. The larvae are deposited in turf infested by the young subterranean grass-caterpillars and move about actively in search of their hosts. The pupal period is passed in the soil and lasts about one month.

Though these parasites are unlikely materially to affect the problem of controlling grass-caterpillars in New Zealand, it is probable that they may prove of value against those of the allied genus *Oncopera* in Australia, and arrangements have been made to introduce puparia of *H. lupina* into that country.

Swezey (O. H.). **Entomology.**—*Rep. Comm. Expt. Sta. Hawaiian Sugar Pl. Ass. 1929–30*, pp. 23–30. Honolulu, 1931.

Perkinsiella saccharicida, Kirk. (sugar-cane leafhopper) has, on the whole, been held in check in Hawaii by introduced natural enemies; an outbreak in January was soon controlled by the egg-sucking bug, *Cyrtorhinus mundulus*, Bredd., which rapidly multiplied with the increase in numbers of the leafhopper. It has been found to be a general rule that the older the sugar-cane the heavier is the damage by *Rhabdocnemis obscura*, Boisd., also that parasitism of the borer by *Ceromasia sphenophori*, Villen., is at a favourable percentage until the cane is about 17 months old, after which it declines progressively. This is largely owing to the accumulation of rubbish, which makes it impossible for the parasites to reach the borers, and emphasises the necessity for the early harvesting of cane. *Anomala orientalis*, Waterh. (cane root grub) is on the whole kept in check by *Scolia* [*manilae*, Ashm.], but in certain fields the effectiveness of the latter seems to be impaired, possibly owing to the removal of weeds on which the adults feed, or to accumulations of rubbish which prevent it from reaching the root grubs. Outbreaks of army worms are less in both number and severity, owing to the work of parasites [*cf. R.A.E.*, A, xviii, 588], including the Mexican Tachinid, *Archytas cirphis*, Curran. *Oxya velox*, F. (*chinensis*, Thunb.) is becoming more widespread in some districts, cane leaves frequently being eaten along roadsides and the edges of fields where there is growing grass, especially nutgrass [*Cyperus rotundus*] on which the smaller grasshoppers feed. Egg-parasites of this and related grasshoppers are known in the Orient, and these may perhaps be introduced into Hawaii.

Takahashi (S.). **Insect Pests of stored Rice and their Control. Appendix: Insect Pests of stored Crops.** [*In Japanese.*]—201 pp., 10 pls., 44 figs. Tokyo, Meibundo, June 1931.

This book deals with more than 30 species of insects that attack stored rice in Japan, and 5 important species infesting other stored

cereals. *Calandra oryzae*, L., *C. sasakii*, Takah., *C. granaria*, L., and *Rhizopertha dominica*, F., are discussed in detail, other pests being dealt with briefly. *C. granaria* was discovered for the first time in Japan in 1923 in rice imported from California, but has not yet become a serious pest there.

A Compendium of the Control of Fungus and Insect Pests. [*In Japanese.*]—356 pp. Sapporo, Hokkaido Agric. Expt. Sta., 1931.

An account is given of the methods of insect control, and the more important insecticides are explained, with brief notes on the bionomics and control of the principal insect pests and on the injuries they cause.

Toyoshima (A.). **Injurious Insects of Apple. I. On the Life-history of** *Carposina sasakii* **Mats.** [*In Japanese.*]—*Results Agric. Expts., Aomori Agric. Expt. Sta.*, no. 26, pp. 1–28, 4 pls. Aomori, Japan, 1931.

In the Aomori Prefecture 113 insects of 39 different families are known to attack apple. The Tortricid, *Carposina sasakii*, Mats., is found in Japan, Korea and Manchuria, chiefly attacking peaches, but causing serious injury to apples in the northern part of Japan, where it also infests pears. The larvae bore in the fruits. There are 2 generations a year, hibernation taking place in the larval stage in the soil. The adults, the females of which slightly outnumber the males, emerge from the middle of June to the middle of September, all stages being found during the summer. One female may lay 100 eggs, which hatch in 6–12 days, and in summer the larval stage lasts 20–30 days. The pupal stage occupies 12–22 days in June and 6–10 in July.

Takano (S.). **On the scientific Name of** *Gaedia ignavus* **Nishikawa, a Parasite of the Silkworm.** [*In Japanese.*]—*Insect Wld.*, xxxv, pp. 218–222. Gifu, 1931.

Gaedia ignavus, Nish., is considered possibly identical with *Pales pavida*, Mg.

Miwa (Y.). **On two Elaterid Beetles injurious to Wheat in China.** [*In Japanese.*]—*Kontyû*, v, pp. 83–85, 2 figs. Tokyo, 1931.

Descriptions are given of *Pleonomus canaliculatus*, Fald., and *P. tschitscherini*, Semenov, attacking wheat in the neighbourhood of Nanking.

Moulton (D.). *Dendrothrips ornatus* **Jablonowski, 1894.**—*Bull. Brooklyn Ent. Soc.*, xxvi, no. 2, p. 75. Brooklyn, N.Y., April 1931.

Dendrothrips ornatus, Jab., is recorded for the first time from North America. It has been observed for the last three or four years on California privet (*Ligustrum ovalifolium*) in New Jersey, and in 1930 apparently caused considerable damage to privet hedges. It is generally distributed throughout the State, but is particularly abundant in the north.

MOZNETTE (G. F.). **How some Factors limit Efforts for artificial Control of the Pecan Nut Case-bearer in the Southeast.**—*Nat. Pecan Ass. Bull.*, iv, no. 1, pp. 40–43. Mobile, Ala., 1930. [Recd. August 1931.]

Experiments in the control of *Acrobasis caryae*, Grote (pecan nut case-bearer), which occurs practically throughout the pecan belt in the southern United States, have shown that if the eggs are coated with certain contact sprays, the embryo may be killed either by desiccation, by cutting off the supply of oxygen or by physically preventing the emergence of the larva. Such sprays as nicotine or certain white oils, however, which kill the eggs when applied at definite strengths, are at present too expensive for general recommendation where many applications are necessary. The eggs of the first generation, against which control measures are mainly directed as most of the injury is caused by the larvae issuing from them, are laid singly on the calyx end or side of the nut, under the calyx lobes or on the buds below the nut cluster, which makes it somewhat difficult to coat all of them thoroughly. The duration of the egg stage (5 days) and the length of the oviposition period (usually 1st–21st May) necessitate at least four applications of an ovicide to ensure the coating of all the eggs of the first generation, but it is hoped that a schedule may be evolved by which at least one or two of these may be combined effectively with sprays for pecan disease control.

Laboratory experiments have shown that, owing to the fact that the young larva ejects the first mouthfuls of food taken, the coating of small nuts with a stomach poison did not deter them from entering. It was found, however, that the newly hatched larva is likely to die if made to crawl over clusters of small nuts recently coated with nicotine sulphate or pyrethrum extract. Experiments with barrier insecticides to kill the larvae as they crawl on the twigs and buds and prevent their entrance into the young nuts have not produced results under conditions prevailing in the south-east, the maintenance of an effective coating throughout the period of activity of the first generation larvae presenting difficulties in face of frequent rains and high winds. Dust mixtures consisting of hydrated lime with as much as 20 per cent. acid lead arsenate failed to give satisfactory control. Experiments with various oil sprays against the hibernating larvae have shown that where the oil penetrates the tightly woven hibernaculum and kills the larva, it also causes injury to the twig. The adults, which are present in the pecan groves from the latter part of April till the end of May and fly at night, are repelled by lights, and no product has yet been found that will attract them to traps. Records in the south-eastern States show that considerable damage was caused by *A. caryae* in 1924, but during the years 1926–1930 the percentage of infestation was slight, and the history of this pest in areas where it has become established shows that it may not inflict damage every year.

KISLANKO (J. P.). **Pecan Insects in Mississippi and their Control.**—*Nat. Pecan Ass. Bull.*, iv, no. 1, pp. 50–52. Mobile, Ala., 1930. [Recd. August 1931.]

Most of the information contained in these brief notes on the life-history and control of the chief insect pests of pecan in Mississippi has been noticed in the preceding paper and elsewhere [*R.A.E.*, A, xviii,

548]. The hickory or pecan twig girdler [*Oncideres cingulatus*, Say], which produces severe pruning of pecan limbs in certain years, especially in neglected orchards, may be controlled by gathering the pruned twigs and burning them, as the eggs are deposited on them. There were three generations of the walnut caterpillar [*Datana integerrima*, G. & R.] in Mississippi in 1927, when many trees were defoliated, but owing to the abundance of natural enemies only occasional colonies have since been found. The larvae may be controlled by lead arsenate sprays.

GILL (J. B.). **Notes on Parasites of Pecan Nut Case-bearer.**—*Nat. Pecan Ass. Bull.*, iv, no. 1, pp. 70–75. Mobile, Ala., 1930. [Recd. August 1931.]

Parasites of the pecan nut case-bearer [*Acrobasis caryae*, Grote], on which brief popular notes are given, include the Tachinids, *Exorista pyste*, Wlk., which attacks the immature larvae in spring and summer and is probably the most effective natural enemy, and *Nemorilla maculosa*, Mg., and *Didyma exigua*, Wulp, which are less generally distributed; *Microbracon* (*Habrobracon*) *cushmani*, Mues. (*variabilis*, Cush.), which is second in importance and sometimes destroys 25 per cent. of the host larvae; the Ichneumonid, *Calliephialtes grapholithae*, Cress., which also attacks the larva of the shuckworm [*Enarmonia caryana*, Fitch]; and the Eulophid, *Secodella acrobasis*, Crwfd., which sometimes parasitises as many as 40 per cent. of the very small overwintering larvae of *A. caryae*.

Some account is given of attempts made in Georgia in 1930 to parasitise *A. caryae* with *Trichogramma minutum*, Riley [*R.A.E.*, A, xix, 490]. Parasites were first placed in pecan orchards about 18th May, when a large portion of the eggs of *A. caryae* had been deposited on the nuts. Eggs were collected at frequent intervals for observation, but practically all hatched normally and none showed signs of parasitism. Later observations where 2,500–15,000 parasites had been placed on marked trees showed parasitism in a few cases, but never in excess of 5 per cent., and there was a complete absence of parasitised eggs on many trees on which large numbers of parasites had been liberated. It is possible that the eggs of *A. caryae* were too mature when attacked by the parasites to provide suitable food for them, and that freshly laid eggs would have proved more palatable and afforded a better basis for determining the maximum degree of parasitism obtainable with *T. minutum*. Eggs of the pecan leaf case-bearer [*Acrobasis ? palliolella*, Rag.] are much more readily attacked, parasitism amounting to over 30 per cent., and the eggs of the walnut caterpillar [*Datana integerrima*, G. & R.], which are laid in masses, are sometimes parasitised to the extent of 90–98 per cent. The highest parasitism does not occur at the beginning of the season, but in the late summer on the second brood of eggs.

HOFFMANN (C. C.). **Una plaga de orugas en los arboles de sombra de los cafetales de Chiapas.** [A Caterpillar Pest of Shade-trees in the Coffee Plantations of Chiapas.]—*An. Inst. Biol. Univ. Mexico*, ii, no. 2, pp. 151–155, 3 figs. Mexico, D.F., 1931.

In some parts of the Chiapas coffee zone, Mexico, *Inga* used as shade for coffee is completely defoliated by Notodontid caterpillars, of which the chief is *Hemiceras subochracea*, Wlk., followed by *H. transducta*,

Wlk., and *H. muscosa*, Schs. Three others, *H. micans*, Schs., *H. cotto*, Dyar, and *H. alba*, Wlk., are unimportant. The injury starts at the beginning of the rainy season, the larvae hatching from eggs laid on the trees, mainly on the upper parts. They pupate among fallen leaves in damp places. These leaves should be collected and burnt or buried at least 8 inches deep. The moths can be caught in light-traps. The increase in the damage done by these indigenous moths is attributed to the relative scarcity of birds, owing to the clearing of forest land for coffee.

Cleare, jr. (L. D.). **The Egg-plant Stem-borer,** *Alcidion deletum*, **Bates (Col. Cerambycidae).**—*Agric. J. Br. Guiana*, iv, no. 2, pp. 82–90, 1 pl. Georgetown, June 1931.

The egg-plant (*Solanum melanogena*), which is much grown in British Guiana, is attacked by several insects, of which the most important is the stem borer, *Alcidion deletum*, Bates, which is present in various coastland districts. The stages of this Lamiid are described. The eggs are deposited singly, though sometimes 2 or 3 may be found together, under the bark of the stem, usually around the nodes. As many as 7 may be deposited by one female in 24 hours ; one of 8 females examined laid 78 in 40 days. The incubation period varied from 3 to 7 days. The larval period in the case of 26 larvae examined varied from 36 to 77 days. Larvae attack stems of any age, but infestation generally begins in the young stems and the larva continues development as the stem increases in size, completely devouring the pith in the area in which it is situated. Pupation occurs within the stem in a cell formed by blocking the mine both above and below with frass and fibre, and the pupal stage lasts 6–8 days. The adult remains within the stem for from 2 to 10 days before emerging. Adults have been observed at various seasons, and it is probable that they occur throughout the year. The longevity of 45 beetles used in rearing trials varied between 3 and 161 days. They feed chiefly on the young and tender shoots, eating small areas of the bark. The circular emergence holes also permit the entrance of disease organisms. The vitality of infested plants is greatly impaired ; the stems frequently split and break, and the period of production seems to be shortened. Apparently three or four generations occur in a year with overlapping, the life-cycle varying from 53 to 96 days. The only parasite reared during these investigations was the Braconid, *Ipobracon waterstoni*, Cam., a larva of which was found parasitising a borer larva, but its importance is not known. The stem-borer could be controlled to a large extent by re-planting more frequently, instead of cutting back the plants for another season ; before re-planting all old plants should be collected and burnt.

Tutin (F.). **Examination of Plants for Insecticidal Principles, II. Elecampane.**—*Rep. Agric. Hort. Res. Sta. Bristol 1930*, p. 71. Long Ashton, Bristol [1931].

Experiments carried out to determine whether the flowers of *Inula helenium* (elecampane) contained any principle toxic to insects gave negative results, even with emulsified extracts representing a concentration of from 10 to 20 per cent. of the original flowers. The fact that these flowers have apparently preserved clothes from the attacks of

clothes moths may probably be ascribed to the volatile substance of a camphoraceous nature which is present in the plant and may act as a repellent without being toxic.

STANILAND (L. N.) & WALTON (C. L.). **The Beet Carrion Beetle** (*Blitophaga opaca*) **and its Control.**—*Rep. Agric. Hort. Res. Sta. Bristol 1930*, pp. 72–74, 1 pl. Long Ashton, Bristol [1931].

Blitophaga opaca, L., is not of general occurrence in England, but occasionally causes serious damage to young mangels or sugar-beet. Among a number of recent reports of infestations, one, which was of 5 or 6 years standing, and occurred in a light loam field in Gloucestershire on some part of which mangels were grown every year, was particularly severe. In 1929 fully 90 per cent. of the young plants were destroyed despite hand-picking of the larvae. The adults hibernate in the soil, etc., and oviposit in the spring. The larvae feed for about 3 weeks on the leaves of young mangels or beet and pupate in the soil. They feed also on carrion and are said to attack chenopodiaceous weeds. Woodlands appear to be the natural habitat. Carrion crows destroy the larvae.

Experiments carried out in early June 1930 showed that plots receiving one application of lead arsenate dust prior to the appearance of the larvae and two after escaped injury, and those receiving the dust after the commencement of the attack were only slightly damaged. Broadcasting naphthalene did not prevent infestation. In Wales, H. W. Thompson has recorded the control of an outbreak by rolling the plants and applying a dressing of soot in June.

STANILAND (L. N.) & WALTON (C. L.). **A Case of Sainfoin Midge** (*Contarinia onobrychidis* **Kieff.**) **in Wiltshire.**—*Rep. Agric. Hort. Res. Sta. Bristol 1930*, pp. 74–75, 1 pl., 2 refs. Long Ashton, Bristol [1931].

In 1930, sainfoin (*Onobrychis sativa*) over a considerable area in Wiltshire was attacked by *Contarinia onobrychidis*, Kieff., and inspection in July revealed a 10 per cent. infestation of the flower heads in one field, 50 to 60 per cent. of the seed pods on such stems being thereby prevented from developing. This Cecidomyiid was apparently first recorded from Britain in 1917 [*R.A.E.*, A, vi, 508]. According to Barnes the larvae remain in the flower heads for a short period in the summer and then pupate in the soil. If the crop is grown for seed, he suggests that it should be cut when infestation is first observed and allowed to flower again.

WALTON (C. L.). **Notes on a serious Tomato Pest** (*Scutigerella immaculata*).—*Rep. Agric. Hort. Res. Sta. Bristol 1930*, pp. 76–78, 3 refs. Long Ashton, Bristol [1931].

Serious stunting of tomatos resulting in the failure of the crop in glasshouses in three counties in western England was due to the destruction of the root hairs by the Scolopendrellid, *Scutigerella immaculata*, Newp. The plants recovered when moved to pots free from the pest. Plants potted with their roots and soil enclosed in grease-paper bags continued to grow until the paper decayed, and the use of such containers (and even newspapers) was therefore resorted to and enabled the plants to gain size (and hence greater resistance)

before being attacked. Treatment of the soil should precede the planting of tomatos, and during that time the pest is situated at depths down to three feet. Deep trenching to expose the subsoil, which was then dressed with soot or other substances, gave good results, but is expensive. Further experiments are being carried out with soil fumigants.

STANILAND (L. N.) & WALTON (C. L.). **Observations on Capsid Bug Control by means of "High Neutral" Tar Distillate Washes in 1930.**—*Rep. Agric. Hort. Res. Sta. Bristol 1930*, pp. 79–94, 2 pls., 11 refs. Long Ashton, Bristol [1931].

In continued investigations with the Long Ashton tar-distillate washes in England in 1930, the "high-neutral" two-solution type of wash failed to show the consistency of efficiency in the control of *Plesiocoris rugicollis*, Fall., on apple that was anticipated from the good results of 1928 and 1929 [*R.A.E.*, A, xvii, 673; xviii, 176]. In all experiments, the wash was applied at a strength of 10 per cent. at the end of January. The possible causes of the varying results obtained by the Station and by individual growers are discussed. The general conclusions reached are: that the wash, properly made and applied, is intrinsically of the high ovicidal value indicated by the previous trials, though its action may be more influenced by the weather conditions than could have been foreseen; that seasonal influences acting on both pest and food-plant can cause relatively wide differences in the ultimate extent of attack (to a degree of which the two previous seasons' trials had given no indication), in spite of little infestation when the trees were in blossom; and that with a newly introduced wash of this type variation in results in its first season of general use must be expected on account of faulty manufacture and application. As regards the direct effect of weather on the wash, seven years' experience with tar distillates has shown them to be less successful when applied in a mild, humid winter than when relatively dry, cold conditions prevail. Rain falling after the application of tar distillates of the old type, even after drying, affects the kill of insect eggs considerably, and though the use of "high-neutral" washes reduces this effect to a minimum, poor results in Capsid control follow rainfall before the spray has time to dry. Moreover, apart from the direct effect of rain, it is also possible that atmospheric humidity may affect the results obtained.

Until further observations are completed, it can be accepted that the experiments of 1930 support those of previous years, but create a doubt as to the adequacy of controlling *P. rugicollis* by egg destruction alone under all types of weather conditions.

STANILAND (L. N.) & WALTON (C. L.). **A Note on the Control of Woolly Aphis on Dormant Nursery Stock.**—*Rep. Agric. Hort. Res. Sta. Bristol 1930*, pp. 106–107. Long Ashton, Bristol [1931].

In an experiment during 1928–29 severe infestations of *Eriosoma lanigerum*, Hausm., on young dormant apple trees were eradicated by immersing them completely for a few minutes in, or thoroughly spraying them with, 10 per cent. tar distillate. This appears to be a cheap and harmless method of cleansing infested nursery stock.

Similar treatment with nicotine and soft soap solution (8 oz. per 100 gals.) was only partly successful, and fumigation with hydrocyanic acid gas (1 oz. sodium cyanide per 100 cu. ft. for 1 hour) proved almost a complete failure.

HUTCHINSON (H. P.) & KEARNS (H. G. H.). **The Control of** *Galerucella lineola*—**a major Pest of Willows.**—*Rep. Agric. Hort. Res. Sta. Bristol 1930*, pp. 108–111. Long Ashton, Bristol [1931].

Galerucella lineola, F., causes extensive damage to willow in parts of England where susceptible varieties are grown [*cf. R.A.E.*, A, xviii, 230], both adults and larvae feeding on the terminal portions of the rod, attacking stem, buds and leaves. The adults hibernate in dead trees, vegetable rubbish, etc., probably near the willow beds, as attacks recur annually and begin near old willow trees growing on the field boundaries. They survive prolonged wet conditions, and it has been observed that flood water acts as a distributing agent, the débris deposited on the beds becoming centres from which the spring attacks arise. After a period of feeding, oviposition commences about the beginning of June, the eggs being laid in batches on the upper leaves of the rod. Pupation takes place in the soil, the adults beginning to emerge during the first week of August. They give rise to a second brood, the adults of which appear in September and enter hibernation when the leaves fall. As a result of both field and laboratory experiments, a brief account of which is given, it was found that effective control may be obtained by thorough spraying against the immature larvae about the third week of June with any of the following insecticides: pyrethrum emulsion (2 gals. extract in 100 gals. water); $\frac{3}{4}$ oz. nicotine, 1 lb. soft soap and 10 gals. water; or 1 lb. lead arsenate, 18 gals. water and an efficient spreader.

HUTCHINSON (H. P.) & KEARNS (H. G. H.). **The Control of** *Phyllodecta vitellinae* **L. (Chrysomelidae) a major Pest of Willows.**—*Rep. Agric. Hort. Res. Sta. Bristol 1930*, pp. 112–126, 2 pls., 1 ref. Long Ashton, Bristol [1931].

The Chrysomelid, *Phyllodecta vitellinae*, L., is a serious pest of willows in the English counties in which susceptible species, particularly *Salix purpurea*, are grown. The adults have a marked preference for feeding on the terminal portion of the rod. This results in branching and renders the plant of little commercial value. The larvae eat the lower epidermis and mesophyll of the leaf, skeletonising the lower leaves first and moving upwards. A list of the species of willow liable to attack is given, indicating their susceptibility. Adults and larvae have been found on poplars. No natural enemies have been observed.

The life-history was studied at Long Ashton, the data being compared with observations in other localities. The adults hibernate, closely packed together, in various sheltered situations. They emerge from April until the end of May, when the buds are bursting. By the beginning of June the total surviving population is in the fields. The oviposition period extends from the last week in May to the third week in June, but may be interrupted by climatic conditions. The eggs, which hatch in 7–14 days, are deposited in batches of 10–30 on the

lower surface of the basal leaves of the rod. The total number laid by one female is approximately 200–300. The larval period occupies 15–23 days and the pupal, which is passed in the soil, about 14. Beetles begin to emerge during the first week in August, increasing until the end of the third week, when the greatest amount of damage done by the adults occurs. They produce a second generation, the life-history of which is similar to that of the first. The adults emerge during the first week in October and feed until the leaves fall, when they enter hibernation.

The difficulty that has been experienced in controlling this pest appears to be due, principally, to ignorance as to time and method of applying various insecticides. The Long Ashton pyrethrum emulsion wash [xviii, 595, etc.] was used at the strength of 2 gals. pyrethrum extract plus rape oil and an emulsifier to 98 gals. water, representing approximately a concentration of 1 per cent. of the original flowers. In laboratory experiments it was not toxic to the eggs, but thorough wetting killed the adults, against which, however, repeated applications at intervals of a few days would be necessary in the field. On the examination of variable results obtained against the larvae, it was found that those of the third instar remained active after spraying owing to the protection of a fluid that is produced on the slightest irritation by the eversion of dorsal protrusible glands. The younger ones were killed by the spray, as the secretion is not sufficient to protect them. The third instar larvae of *Galerucella lineola*, F., which possess no protrusible glands, are killed by a light spraying with the emulsion. The sprayed foliage had no toxic effect on the third instar larvae. Field experiments demonstrated that, provided that oviposition is not interrupted, one spraying is sufficient, but more should be applied if an interruption of over about 10–14 days occurs.

From laboratory experiments it was concluded that a dust of light petroleum extract of pyrethrum with kaolin as a carrier would not provide a satisfactory means of control. The beetles will not feed on foliage sprayed with lead arsenate. They can live at least 14 days without food, and during that time new foliage may grow. Lead arsenate, provided that it is used with an efficient spreader, is an efficient larvicide and repellent to oviposition [*cf.* xiii, 486].

Kearns (H. G. H.). **The larval and pupal Anatomy of** *Stenomalus micans* **Ol. (Pteromalidae), a Chalcid Endoparasite of the Gout-fly of Barley** (*Chlorops taeniopus* **Meig.), with some Details of the Life History of the Summer Generation.**—*Parasitology*, xxiii, no. 3, pp. 380–395, 5 figs., 10 refs. Cambridge, July 1931.

Barley was severely infested in 1928 by *Chlorops taeniopus*, Mg., in many counties in southern England. Two species of endoparasites, *Stenomalus micans*, Ol., and *Coelinius niger*, Nees, were found in every sample of "gouted" barley examined. Parasitism amounted to 68 per cent., two-thirds of which was due to *S. micans*. This percentage was based on a count of shoots of winter type damage (very stunted growth and shoot with no trace of ear); parasitism does not appear to be so high in other forms of damaged shoots. *S. micans* and its host both have two generations a year. *C. taeniopus* oviposits on young tillers of the barley plant in April, there being usually only one larva to a tiller. *S. micans* appears shortly afterwards and usually deposits

one egg on each young host larva. Larvae of *C. taeniopus* that escape parasitism produce adults in August. These oviposit mainly on young couch grass (*Agropyrum repens*), and the adults of the summer generation of the parasite follow them and oviposit in the young larvae. Both host and parasite hibernate as larvae; the parasite does not feed actively until the spring, when the host is nearly full-grown. The five larval instars and the pupa of *S. micans* are described, and sex differences in the latter are indicated. Emergence, which is described in detail, occurs 14 days after pupation (in 1928 chiefly between the first and third weeks of August), males and females emerging at the same date. The adults feed on the exudations on the stems of green tillers of barley and have also been captured on various umbelliferous plants.

JARY (S. G.). **Some Observations on Winter Moth Caterpillar Attack on Fruit Trees in 1929-1930.**—*J. S.-E. Agric. Coll.*, no. 28, pp. 137–146, 2 refs. Wye, Kent, 1931.

An account is given of investigations during 1929–30 in an apple orchard in Berkshire on certain aspects of the bionomics and control of winter moths, of which the common species in England are *Cheimatobia brumata*, L., *Hybernia defoliaria*, Cl., and *Anisopteryx aescularia*, Schiff. The time of emergence of the moths, the females of which are wingless, was obtained by banding some of the trees with adhesive, the bands being examined at intervals of a week. The emergence period of *C. brumata* and *H. defoliaria* lasted from late October to the end of January, the former reaching a maximum on 29th November. *A. aescularia* was not observed at all, and over 99 per cent. of the females collected were *C. brumata*. Females of *Phigalia pedaria*, F. (*pilosaria*, Schiff.) were also occasionally taken. Tests to determine the efficiency of banding in control showed that even the most carefully kept bands did not entirely prevent attack, although the banded trees were as free from damage as those that were thoroughly sprayed. Under commercial conditions, with little attention given to the bands, and particularly when the moths are abundant, bands do not prevent considerable numbers from ascending the trees.

On the unbanded trees, eggs of *C. brumata* were mostly laid on the smaller branches and fruit spurs. Of 2,300 eggs collected, about 50 per cent. were in no way concealed, 21·5 were totally hidden beneath bud-scales, dead bark, etc., and the remainder were barely visible; many may be also deposited on stakes, etc., supporting the trees.

Tests conducted against the eggs with proprietary tar oil washes, applied early in February (after emergence of the adults had ceased) at a pressure of 150 lb., so that trees were thoroughly covered, show that a wash of the Long Ashton type (2 solution) [*cf. R.A.E.*, A, xvii, 120] used at 10 per cent. strength was less effective than one of the ordinary type of the same strength; at 6 per cent. it did not give sufficient control to be of commercial value and had to be followed by a lead arsenate spray. Preliminary investigations show that tar oil washes certainly fail to kill some proportion of the eggs that are laid superficially, as well as those that are completely hidden.

JARY (S. G.). **A Note on the Strawberry and Raspberry Bud Weevil,** *Anthonomus rubi* (**Herbst**).—*J. S.-E. Agric. Coll.*, no. 28, pp. 147–152, 5 figs. Wye, Kent, 1931.

Notes are given on observations in Hampshire during 1929–30 on *Anthonomus rubi*, Hbst., which is often a pest of considerable importance on both strawberries and raspberries, and is widely distributed throughout southern England. All stages are described. Hibernation is passed in the adult stage, usually in the curled leaves in the débris found at the base of hawthorn hedges along the sides of strawberry fields. Overwintered adults begin to appear in the strawberry fields in late April or early May, and feed on the developing foliage in the crown of the plants and on the opening blossoms. The foliage is not apparently killed, but during a heavy infestation there must be a considerable check to normal growth. The process of egg-laying is described. Oviposition usually occurs on the secondary (lateral) buds, from mid-May until the end of June, one egg being laid in each bud. After having laid the egg, the female cuts half-way through the underside of the stalk about $\frac{1}{8}$-in. from the bud, with a result that the latter often drops and in any case is soon killed. The heaviest amount of damage occurs at the beginning of June, whereas on raspberries similar attacks do not take place until the middle of the month and the buds seldom fall. By the end of June all the weevils have disappeared. Adults of the new generation begin to appear after about mid-July, and become quite numerous a week later. They feed on the leaves of the plants, but cause little damage and begin to enter hibernation towards the end of August.

Remedial measures suggested include the use of an arsenical dust during the feeding period of the overwintered adults, early in May, when the plants are relatively free from superfluous foliage, and the provision of dry hibernation quarters as traps. Burning the straw that has been lifted from beneath the rows of strawberry plants and left to dry more or less covering them is unlikely to destroy more than a small percentage of the weevils in any stage, as immature stages in buds on the soil or adults hiding in the crowns of the plants will probably escape.

AUSTIN (M. D.). **A Contribution to the Biology of the Apple Capsid** (*Plesiocoris rugicollis* **Fall.**) **and the Common Green Capsid** (*Lygus pabulinus* **Linn.**).—*J. S.-E. Agric. Coll.*, no. 28, pp. 153–169, 8 figs., 20 refs. Wye, Kent, 1931.

The economic importance in south-eastern England of *Plesiocoris rugicollis*, Fall., all stages of which are described, is discussed with special reference to its occurrence on apple, and an account is given of its bionomics [*cf. R.A.E.*, A, vi, 278; xvii, 678]. The occurrence of a second generation has not been observed, and no immature stages were found in the field after June. Up to 43 eggs may be laid by one female. The life-cycle from egg to adult lasted 5–6 weeks.

The occurrence of *Lygus pabulinus*, L., as a serious pest of currants, gooseberries and apple is recorded, the bulk of the injury being caused by first instar nymphs of the first generation. A list of some of its food-plants is given, with an account of its biology [xvi, 619; xvii, 678], and descriptions of all stages. Development from the hatching

of the overwintered eggs to the appearance of the adults lasted 5–6 weeks.

The characters distinguishing the nymphs of *P. rugicollis* and *L. pabulinus* are indicated.

Barnes (H. F.). **Observations on Gall Midges affecting Fruit Trees.**—*J. S.-E. Agric. Coll.*, no. 28, pp. 170–177, 4 figs., 10 refs. Wye, Kent, 1931.

Notes, which are mainly based on the literature, are given on the bionomics and control of *Dasyneura pyri*, Bch., and *Contarinia pyrivora*, Riley, both on pear; *Thomasiniana oculiperda*, Rubs., on rose and apple; and *T. theobaldi*, Barnes, on raspberry. Some of these, as well as *Dasyneura mali*, Kieff. (leaf-curling apple midge), are recorded from new localities in the British Isles. In July 1928 and again in June 1930, the larvae of *Dasyneura* sp. were found injuring young black currant bushes in Kent, the terminal leaves of the plants attacked being folded and twisted. Although considerable damage was observed in July 1929, no larvae could be found. Preliminary observations in the insectary showed that the adults readily oviposited on black currant, but could not be induced to do so on red currant, gooseberry and raspberry.

Martin (H.). **The Preparation of Oil Sprays. 1. The Use of Oleic Acid as Emulsifier.**—*J. S.-E. Agric. Coll.*, no. 28, pp. 181–187, 6 refs. Wye, Kent, 1931.

The following is taken from the author's summary: To facilitate experiments on the fungicidal and insecticidal properties of glyceride oils (fatty esters of glycerine derived from plant and animal sources) a simple method of emulsification is required. It is shown that the easy emulsification of some glyceride oils (cottonseed oil and sesame oil) by shaking with a soap solution is due to the presence of free fatty acid. The addition to refined oils of oleic acid stabilises the emulsion produced by shaking with soft soap solution. It is also shown that a dilute solution of alkali may be used instead of the soap solution, whereby the troublesome process of preparing a concentrated soap solution is avoided. Suitable amounts of oleic acid for solution in the oil and of sodium hydroxide for solution in the water are determined for soft water and for that of medium hardness. The method finally adopted is similar to the two-solution Long Ashton method [*cf. R.A.E.*, A, xvi, 585] with the difference that oleic acid replaces the proprietary sulphonated oils (Agral preparations). The use of oleic acid in place of Agral WB for the preparation of experimental tar oil sprays is discussed, and formulae are given for the preparation of emulsions of tar oils and of tar oil-petroleum oil mixtures. As Agral WB is insufficiently soluble in petroleum oils for the preparation of suitable sprays for summer use, oleic acid is recommended, and methods are given for the emulsification of these and other hydrocarbon oils.

Sicard (H.). **Note préliminaire sur la biologie et la morphologie larvaires de** *Degeeria luctuosa* **Meig.** (*funebris* **Meig.**) **Tachinaire parasite de l'altise de la vigne.**—*Bull. Soc. ent. Fr.*, 1931, no. 10, pp. 158–162, 1 pl., 4 refs. Paris, 1931.

The cycle of development of *Degeeria luctuosa*, Mg., a parasite of the adults of *Haltica ampelophaga*, Guér., is discussed. It

hibernates in the second larval stage within the host, continuing its development when the latter leaves its winter shelter to begin feeding in spring. The pupation of the parasite corresponds with the oviposition of the host, and in early May when the host larvae begin to appear, the first adults of *D. luctuosa* may be observed. The parasites, however, ignore these larvae and generally attack the overwintered generation of *H. ampelophaga*, which is thus parasitised in spring by two successive generations. The adults of the summer generation of *H. ampelophaga* are also parasitised as soon as they appear at the end of June, and the cycle is continued until the hibernation of the host begins. The action of this Tachinid would be even more marked if it were not attacked by a Hymenopterous hyperparasite that sometimes emerges from the pupae. *D. luctuosa* is not specific to *H. ampelophaga* and has been obtained in the Pyrenees from adults of the Galerucid, *Agelastica alni*, L. Details are given of the development of the parasite within the host and of the external morphological characters of the larva, which differs in certain respects from that of *D. collaris*, Fall. [*R.A.E.*, A, viii, 432].

ZWÖLFER (W.). **Studien zur Oekologie und Epidemiologie der Insekten. 1. Die Kieferneule,** *Panolis flammea* **Schiff.** [Studies on Insect Ecology and Epidemiology. 1. The Pine Moth, *P. flammea*.]—*Z. angew. Ent.*, xvii, no. 3, pp. 475–562, 2 figs., 24 diag., 77 refs. Berlin, April 1931.

Formulae for expressing the relation between environmental factors and the rate of increase of insects are discussed, and a very detailed account is given of investigations on the effect of climate on the abundance of *Panolis flammea*, Schiff. They apply to one generation from pupae collected in South Germany in winter. Under optimum conditions of temperatures between 8 and 27° C. [46·4 and 80·6° F.] and an atmospheric humidity of 80–90 per cent. there was an average of 190 eggs (laid and ready for laying) per female, and the different temperatures proved unimportant at this degree of moisture. With 100 per cent. humidity fewer eggs were produced (average 150), especially at the higher temperatures. The minimum temperature at which pupae could give rise to adults lay between 4 and 8° C. [39·2 and 46·4° F.]. The optimum for pairing was between 12 and 16° C. [53·6 and 60·8° F.], and for oviposition, between 14 and 16° C. [57·2 and 60·8° F.], both at 60–90 per cent. humidity. Continuous moisture at saturation point was disadvantageous to egg development, pairing, oviposition, and length of adult life. The combinations of temperature and humidity at which the rate of mortality was lowest were 12–22° C. [53·6–71·6° F.] and 65–85 per cent. for the eggs (which were very susceptible to continuously saturated air), 17–18° C. [62·6–64·4° F.] and 80–90 per cent. for first instar larvae, and below 6° C. [42·8° F.] and 100 per cent. for hibernating pupae.

Thus the first-stage larva is the stage of *P. flammea* that is most susceptible to climate and most critical from the point of view of outbreaks. In Central Franconia, it occurs from the end of May to mid-June. At this period a rainfall of about 0·2 ins. is favourable to the larvae, whereas a rainfall of 0·6–0·8 ins. or more decreases their abundance. The duration of the immature stages depends largely on temperature, atmospheric moisture being of secondary significance. Starvation tests with

newly hatched larvae showed that their period of survival depended largely on temperature and moisture, with a maximum of 13 days at 4° C. [39·2° F.] and 100 per cent. humidity. The first stage larvae feed on May shoots that have only attained a certain degree of maturity.

Berwig (W.). **Laboratoriumsversuche zur Bionomie und Bekämpfung der Forleule.** [Laboratory Experiments on the Bionomics and Control of *Panolis flammea*.]—*Z. angew. Ent.*, xvii, no. 3, pp. 563–586, 16 figs. Berlin, April 1931.

An account is given of laboratory experiments with *Panolis flammea*, Schiff., made in 1930 at Munich. The weight of excreta produced daily by larvae of different instars at different temperatures is estimated, and details are given of the hours of feeding and of the process of digestion in the larvae of this moth and of the nun moth [*Lymantria monacha*, L.].

The effect of arsenical dusts was tested at various temperatures on the different instars of *P. flammea*. These insecticides are very toxic to the larvae ; a small amount of poison reduces feeding markedly, stops larval development, and kills mature larvae in 1–5 days, and 80 per cent. of third-instar larvae, which are the most rapidly affected, in 1 day. Poisoning occurred even after a slight dusting after which only a few particles of insecticide could be seen on the pine needles when branches brought in from a treated forest were examined with a lens. The action of the insecticide was strongest at 22° C. [71·6° F.] and weakest below 15° C. [59° F.]. Even in the case of older larvae, feeding for 24 hours on dusted twigs ensured poisoning, although unpoisoned food was subsequently given, but feeding for 12 hours was insufficient.

Weis (I.). **Versuche über die Wirkung von Kontaktgiften auf Schmetterlingsraupen.** [Experiments on the Action of Contact Poisons on Lepidopterous Larvae.]—*Z. angew. Ent.*, xvii, no. 3, pp. 587–600, 1 fig., 11 refs. Berlin, April 1931.

Contact dust insecticides are now being manufactured for use against Lepidopterous forest pests, as their effect does not depend on feeding, which varies with the weather. Experiments with two proprietary contact poisons, one a preparation of derris, are described. They proved of little value against hairy caterpillars, such as those of *Nygmia phaeorrhoea*, Don. (*Euproctis chrysorrhoea*, auct.) and *Porthetria* (*Lymantria*) *dispar*, L., as the hairs only allow a small proportion of the dust to reach the skin. Good results were achieved with hairless larvae, and experiments with second and third instar larvae of *Panolis flammea*, Schiff., and *Bupalus piniarius*, L., showed that the early instars are most susceptible, and that quite small amounts of poison suffice to kill 100 per cent. within 3 days.

Steiner (P.). **Zur Kenntnis der Parasiten des Kiefernspanners.** [The Parasites of *Bupalus piniarius*.]—*Z. angew. Ent.*, xvii, no. 3, pp. 601–630, 7 figs., 15 refs. Berlin, April 1931.

The outbreak of *Bupalus piniarius*, L., on pines in Mecklenburg in 1927–30 enabled investigations to be made on its parasites. *Trichogramma evanescens*, Westw., and *Telenomus* sp. were the egg-parasites observed. They are favoured by mixed stands, the percentages of

parasitised eggs being 17·66, 37·62 and 49·2, respectively, in unmixed pine stands, pine stands with spruce underplanting, and mixed forests. The other parasites of practical value were the Ichneumonids, *Anomalon biguttatum*, Grav., *Ichneumon nigritarius*, Grav., *I. locutor*, Thnb., and *Heteropelma calcator*, Wesm., and the Tachinids, *Lydella nigripes*, Fall., and *Carcelia rutilla*, B. & B. Prior to the peak of the outbreak, Ichneumonids predominated, the Tachinids replacing them later. *I. nigritarius* seems to have only one generation a year in Mecklenburg, and to pass direct from one generation of *B. piniarius* to the next.

According to breeding experiments, in 1928, 27 per cent. of the pupae were parasitised. In 1929, the peak year of the outbreak, the figure was 41·94, and in 1930, when it terminated, 62·635. Parasites were therefore not the sole cause of its extinction, fungi and bacteria being other important agents. Where more than one parasite occurs in a single host, the species with the most rapid development survives. *I. nigritarius* is therefore not affected by other parasites, but *H. calcator* and *A. biguttatum* develop less rapidly than the Tachinids.

Lindinger (L.). **Bericht über die Tätigkeit der Abteilung für Pflanzenschutz.** [Report on the Activities of the Department of Plant Protection, Hamburg, January–December 1930.]—*Jber. Inst. angew. Bot. Hamburg 1930*, pp. 102–125. Hamburg, 1931.

This report is similar in character to preceding ones [*R.A.E.*, A, xvii, 699; xviii, 629]. The records of Coccids and their food-plants from many parts of the world are continued, and corrections to previous lists are given.

Trenkle (—). **Ist der Apfelblütenstecher schädlich?** [Is the Apple Blossom Weevil injurious?]—*NachrBl. deuts. PflSchDienst*, xi, no. 7, pp. 49–50. Berlin, July 1931.

Disagreement is expressed with the views of observers who have concluded that the apple blossom weevil [*Anthonomus pomorum*, L.] is not injurious [*R.A.E.*, A, xix, 248, 424, etc.]. It is suggested that climatic and other factors may have a bearing on this point, and that while the above conclusion may be true for Berlin, it is not necessarily so for southern and western Germany.

Avenarius (R.). **Ueber die Prüfung von Raupenleim.** [The Testing of a Banding Adhesive.]—*NachrBl. deuts. PflSchDienst*, xi, no. 7, pp. 51–53, 2 figs. Berlin, July 1931.

A good banding adhesive must not flow off its support, especially when exposed to sunshine. To test this quality a small piece of waterproof card is attached to a metal frame, the metal being 2 mm. thick. The adhesive is then brushed across the card and frame so as to have a layer of 2 mm. thickness on the former, which is then fixed vertically on a stand that bears a thermometer the bulb of which is brought quite close to the centre of the card. The stand is gradually moved towards an electric radiator to ascertain the temperature at which the adhesive layer flows. Another apparatus is designed to ascertain the period during which an adhesive remains effective and the degree of its effectiveness at different times during this period. A pendulum is so constructed that when it is at rest an arm attached to its upper end is not in contact with a vertical plate at a right angle

to the plane in which the pendulum swings. The tip of the arm is bent towards the plate. By means of an electro-magnet the pendulum is held in a position where this tip is still farther away from the plate. The plate is smeared with the adhesive and the pendulum is released. The tip of the arm touches the adhesive, and the time during which it is held fast by the adhesive is the measure of the latter's efficiency. The tip is best covered with silk.

KIRSCHNER (R.). **Beiträge zur Bekämpfung von** *Ephestia elutella* **Hb.** [Contributions to the Control of *E. elutella*.]—*Mitt. Ges. Vorratsschutz*, vii, no. 4, pp. 42–43, 1 fig. Berlin, July 1931.

An extremely severe infestation by *Ephestia elutella*, Hb., in the store-rooms of a food-products factory, in which fumigation was impossible, was successfully controlled by removing the stock, spraying the rooms with a solution of nicotine and soap, and smearing all cracks with a paste of water glass and plaster of Paris.

PIGORINI (L.) & others. **Annuario della R. Stazione bacologica sperimentale di Padova. Vol. xlvi.**—vii+848 pp., illus. Padua, 1931.

This volume includes numerous papers on the embryology and diseases of *Bombyx mori*, L.

WHITE (R. W.). **Pink Bollworm scouting Methods.**—*Mon. Bull. Dept. Agric. California*, xx, no. 6, pp. 363–370, 7 figs. Sacramento, Cal., June 1931.

Field inspection methods hitherto in force in the cotton belt of the United States for discovering infestation by the pink bollworm [*Platyedra gossypiella*, Saund.], which is known to occur in parts of Texas, New Mexico and Arizona, are described, and the advantages of the recently adopted method of gin trash inspection are pointed out. Details are given of a machine constructed to separate the bollworms from trash, effecting a considerable saving in the inspectors' time. This machine can only be used satisfactorily from the beginning of the ginning season until the first killing frost (September–December), after which the bollworms hibernate and are not found so readily in the trash.

In order to deal with the large portion of the cotton belt in which some other means of inspection is necessary, and which cannot be covered during the favourable period, arrangements have been made for the collection of bolls when they are most liable to infestation and their preservation until inspection is possible. About 10,000 samples of 100 green cotton bolls each were collected from all States making up the cotton belt, and this material was examined in the laboratory from 1st January onward by a method that is described in detail.

GRAY (G. P.) & KIRKPATRICK (A. F.). **The Diffusion of Hydrocyanic Acid Gas.**—*Mon. Bull. Dept. Agric. California*, xx, no. 6, pp. 373–382, 3 graphs, 12 refs. Sacramento, Cal., June 1931.

The importance of even distribution of gas in the fumigation of *Citrus* trees with hydrocyanic acid gas is briefly discussed from the literature, and the results of recent research in the control of resistant

strains of Coccids [*Saissetia oleae*, Bern., and *Chrysomphalus aurantii*, Mask.], which has already been noticed [*R.A.E.*, A, xviii, 41, 203], are recapitulated with additional data and graphs.

MACKIE (D. B.) & GAMMON (C.). **Control of the Walnut Fly.**—*Mon. Bull. Dept. Agric. California*, xx, no. 6, pp. 384–388, 5 figs. Sacramento, Cal., June 1931.

An account is given of an experiment in the control of *Rhagoletis suavis completa*, Cress., in California, by covering the ground beneath the trees with heavy building paper to prevent the emergence of adult flies and the entry of larvae into the soil to pupate. The paper was laid in overlapping strips, the edges being cemented together with melted tar. Finally all edges were buried 4 inches deep to prevent the wind from lifting it. Newspaper or cotton wadding had to be used in adjusting the paper around the collars of the trees. Five acres of paper were laid in 9 days, the work being finished on 31st July and the cost of laying averaging £75 an acre. Examination of the crop harvested showed about 12 nuts with injury similar to that caused by *Rhagoletis*, but in three cases this was found to be due to other causes. The paper was removed on 14th November, after all flies were dead and the immature stages were in the ground. In addition to the great cost of this method, the fact that 20–33 per cent. of the adults remain in the ground for a second season would render a double operation of papering necessary to ensure the death of all flies. It was also found that deterioration of the paper from the effect of sunlight makes it easy to rupture, even through falling of the nuts during ripening.

BROWNE (A. C.). **Heat Treatment of Apples for Mealybug Control.**—*Mon. Bull. Dept. Agric. California*, xx, no. 6, pp. 389–391. Sacramento, Cal., June 1931.

Serious infestation of apple orchards by mealybugs occurs in Santa Cruz County, California, and as they remain on the harvested fruit, an experiment was carried out in which six boxes of apples artificially infested with *Pseudococcus gahani*, Green, were subjected to heat sterilisation. All mealybugs and egg masses present were killed by exposures of 6 and 8 hours to a temperature of 110° F. at a humidity of 97–100 per cent., the time required to bring the fruit up to the desired temperature being 12 hours.

HARDOUIN (R.). **Matériaux d'éthologie concernant** *Otiorrhynchus rugosostriatus* **Goeze (Col. Curculionidae).**—*Bull. Soc. ent. Fr.*, 1931, no. 11, pp. 179–182, 1 fig. Paris, 1931.

HOFFMANN (A.). **Description de la larve d'***Otiorrhynchus rugosostriatus* **Goeze.**—*T.c.*, pp. 183–184.

Larvae of *Otiorrhynchus rugosostriatus*, Goeze, were found to be causing considerable damage to underground parts of *Cyclamen* and *Primula* in the Paris district, the roots being much eaten away. Young larvae kept under observation from early November began to pupate by 26th January, but development varied greatly in individuals, probably owing to different degrees of humidity. The adults have

been taken on blackberry and, in large numbers, on rose, working in the night and cutting off the leaves. The original food-plant is probably rose, the insect being introduced on to cyclamen in the compost used for potting. No males were observed by either author; apparently the weevil reproduces parthenogenetically, as do other species of the genus. Against the larvae, powdered naphthalene should be mixed with the earth when potting, just before use.

FRAPPA (C.). **Notes biologiques sur quelques insectes nouveaux ou peu connus et nuisibles aux plantes cultivées à Madagascar.**—*Bull. Soc. ent. Fr.*, 1931, no. 12, pp. 186–192, 9 refs. Paris, 1931.

The insects here enumerated from Madagascar and not recorded in recent reports include the Tettigoniid, *Amblylakis nigrolimbata*, Redt., which devours the leaves, branches and stems of vines; and the Acridids, *Finotina radama*, Brancs., the adults of which attack the leaves of cassava [*Manihot utilissima*], and *Phymateus saxosus*, Coq., which lives in colonies on various wild plants and particularly on *Crotalaria* spp., the adults infesting rice and coffee, of which they devour the young shoots. Hemipterous pests are *Nezara pallidoconspersa*, Stål, which is abundant on groundnuts [*Arachis hypogaea*] and castor-oil plants [*Ricinus communis*]; *Dieuches annulatus*, Sign., *Stenozygum madagascariense*, Sign., and *Tropidothorax* sp., which also live on castor; *Anoplocnemis luctuosa*, Stål, which attacks the young shoots of cotton, young peaches, beans and other plants; *Phenacaspis* (*Chionaspis*) *dilatata*, Green, which infests the leaves of mango and is attacked by a small Hymenopterous parasite; and *Mytilaspis dispar*, Vays., on leaves of cassava. Coleopterous pests include the Melolonthids, *Encya strigiscutata*, Fairm., the adults of which feed on the leaves of trees, *Enaria melanictera*, Klug, reported on cacao and observed in artificial plantations of *Eucalyptus*, the adults eating the leaves, and *Hyposerica* (*Serica*) *castanea*, Blanch., the adults of which eat the leaves of cassava and various fruit trees; the Cetoniid, *Doryscelis calcarata*, Klug, on tea; the Coccinellid, *Solanophila pavonia*, Ol., which attacks a variety of plants, particularly Solanaceae; the Eumolpid, *Colasposoma cyaneicornis*, Pic, which injures the leaves of sweet potato; *Lagria villosa*, F., on rice, cotton, and other plants, the damage being of minor importance; *Xyloperthodes castaneipennis*, Fhr., mining in the woody stems of cotton, *Mimosa* and *Lagerstroemia*; and the Lamiid, *Demagogus* (*Sternotomis*) *cornutor*, F., in the wood of various Aurantiaceae. *Drosophila repleta*, Woll., attacks many fruits, including peaches, plums and apricots. *Ceratitis capitata*, Wied., has been recorded from Madagascar, but has never been found by the author. *Eumenes regina*, Sauss., is an important predacious enemy of the larvae of *Diatraea venosata*, Wlk. (*striatalis*, Snell.) (sugar-cane borer).

MANON (—). **Au sujet des parasites des bouchons des bouteilles à vin en particulier d'***Oenophila v-flavum* **Haw.**—*Rev. Zool. agric.*, xxix, no. 12, pp. 184–188, 1 ref. Bordeaux, December 1930. [Recd. August 1931.]

A number of bottles of wine with leaking corks, dating from 1878 and purchased in 1908, were found to be infested with *Oinophila*

v-flavum, Haw. The corks, particularly those that were well soaked with wine, were filled with larvae of varying sizes, indicating multiple broods. A number of these corks were placed in two bottles, one of which was immediately transferred to ordinary room temperature and the other inadvertently left for 14 days in the cellar before being placed with the first. Adults of *Oinophila* emerged from the corks in the first bottle in June, the following month, and emergences continued in each successive month until 10th February. The apparently unlimited emergence period of this Tineid renders it possibly the most dangerous insect pest of wine-bottle corks. A fly, possibly a parasite of it, also emerged from the corks, but only in July. Meanwhile no emergence whatever had taken place from the corks that had first been left for 14 days in the cellar, on which a slight mildew had begun to form, and on examination all the larvae were found to have perished. The moths are attracted by the odour of the wine and leave dry corks untouched. The eggs are laid beside the neck of the bottle, and the young larvae bore first in the portion of the cork nearest to the bottle, penetrating later into the centre. It would therefore appear that the bottles should be corked without previous soaking of the corks in wine and that these should be immediately covered with a capsule. Before or in place of the application of capsules the corks may be brushed over with pure carbon bisulphide. From time to time, in the case of uncapsuled bottles, a concentrated solution of copper sulphate should be brushed on the cork at the level of the bottle-neck. It is moreover advisable, when leaking bottles are purchased, to remove all the corks and burn them before introducing the bottles into a wine-cellar.

MUGGERIDGE (J.). *Pieris rapae:* **A recently introduced Cabbage Pest.**—*N.Z. J. Agric.*, xlii, no. 6, pp. 428–432, 4 refs. Wellington [N.Z.]. June 1931.

Pieris rapae, L., an account of the bionomics and control of which is given from the literature, was first observed in New Zealand in 1930 and now appears to be well established. It was possibly imported with vegetables from Hawaii.

ADKIN (R.). *Laspeyresia (Carpocapsa) pomonella* **L. bred from Melon.**—*Entomologist*, lxiv, no. 820, p. 213. London, September 1931.

A single larva of *Cydia (Laspeyresia) pomonella*, L., was found on 5th October 1930 in a melon from a frame in England and reared to the adult stage.

ADKIN (R.). *Batodes angustiorana* **Haw. (Lep.) bred from stored Apples.**—*Entomologist*, lxiv, no. 820, p. 214. London, September 1931.

For some years larvae have been observed feeding under the wrapping papers of stored apples in England, making a certain amount of web between the paper and the fruit, on the skin of which they feed. In 1931 a single individual was reared, which proved to be the Tortricid, *Batodes angustiorana*, Haw.

GRANDORI (R.). **Esperimenti di lotta contro il Maggiolino** (*Melolontha vulgaris* **L.**) **mediante il Para-Italia** (**Paradiclorobenzolo**). [Experiments in combating the Larvae of *M. melolontha* with Paradichlorobenzene.]—*Boll. Lab. Zool. agrar. Bachic. Milano*, i (1928–29), pp. 89–93, 1 fig. Milan, 1930. [Recd. July 1931.]

As a result of experiments in which all larvae of *Melolontha melolontha*, L. (*vulgaris*, F.) attacking vines were killed with paradichlorobenzene, the following recommendations are made: The crystals should be strewn at the rate of about ⅔ oz. per linear yard in parallel furrows about 8–10 inches deep and about 3 ft. apart. The furrows should then be filled in and the earth stamped down. The work is best done in November and December, but may be carried out as late as March.

GRANDORI (R.). **Esperimenti di lotta contro la Filossera della vite** (*Phylloxera vastatrix* **Plan.**) **mediante il Para-Italia** (**Paradiclorobenzolo**). [Experiments in combating the Vine *Phylloxera* with Paradichlorobenzene.]—*Boll. Lab. Zool. agrar. Bachic. Milano*, i (1928–29), pp. 95–110, 5 figs. Milan, 1930. [Recd. July 1931.]

Six vineyards of European vines severely infested by *Phylloxera* in six provinces of northern Italy were used for the tests described. On each side of a row of vines furrows 6–8 inches deep were dug, and paradichlorobenzene was strewn in them at the rate of about ⅔ oz. per linear yard, the soil being then filled in. Two applications were made, in November or December and in March or April, except in one vineyard in which only the winter application was made, and in a different manner. In this case no result was achieved, but of the other five tests, two were entirely successful, the vines, when examined in June, being in luxuriant vegetation as if never attacked by the pest. The third, fourth, and fifth vineyards showed good, fair, and mediocre results respectively. It is concluded that paradichlorobenzene is of practical value in checking *Phylloxera* sufficiently to enable satisfactory crops to be obtained.

DEL GUERCIO (G.). **I Punteruoli più importanti dell'olivo.** [The more important Scolytid Borers of the Olive.]—*Redia*, xix, pp. 1–74, 35 figs. Florence, 31st March 1931.

An account is given of the bionomics and control of the Scolytid, *Phloeotribus scarabaeoides*, Bern., a serious pest of olives in Italy, based partly on the literature and partly on the author's own observations. In February or March the adults emerge from cavities they have made for shelter and feeding in the forks at the bases of the twigs that bear leaves and flowers. As many of these twigs fall, the infestation results in a crop loss that increases yearly. The death of the twigs gradually affects the whole crown. Oviposition occurs in unhealthy branches or in those lying on the ground, provided that they still contain sap. Branches with smooth bark are preferred. A female may lay 20–50 eggs, the oviposition period lasting about 40 days in February and March, or about 25–30 in May or June. Incubation

requires about 20 days in winter and 14 in spring, so that before the last eggs are being laid the first larvae are making mines that branch off the mother gallery ; in these they pupate. The pupal period lasts 12–15 days, and the adults begin to emerge at the end of May or early in June, the majority appearing in July. Subsequent generations emerge in late August and early September, and in late October and early November, though some individuals probably pass the winter as larvae and pupate in the following year. Neglect of pruning and of soil cultivation favours *P. scarabaeoides*, and its spread is increased by using twigs and branches for fencing, etc.

In February and March the trees should be well pruned, all unhealthy parts being removed. The twigs should be buried near the trees to loosen the soil and supply organic matter to it, and two-thirds of the larger branches should be covered with earth, etc., to preserve their freshness and protect them from attack. The other third should be distributed as traps and left until early May when they should be burnt. Half of the covered branches should then be used as traps until the end of August, and the remainder until early November. Young olive plants may be protected by thick washes of milk of lime.

P. oleiphilus, sp. n., which occurs on the Adriatic side of Italy has often been confused with *P. scarabaeoides* ; the characters distinguishing them are described.

Hylesinus oleiperda, F., is of considerable importance in Tuscany. The adults begin to appear about mid-May, and the female bores a subcortical mine in a branch and oviposits there. Oviposition continues throughout June. The larvae, which feed under the bark, pupate in the following spring, 10 or 11 months after hatching, the pupal period lasting about 10 days. Infestation is promoted by fine weather at the time of emergence of the adults, neglect of cultural measures and failure to destroy prunings. It is checked by a combination of rain and wind, and by a bacterial disease of the larvae and pupae. *Cheiropachys colon*, L., has been recorded as an endophagous parasite. The infestation causes the fall of the flowers in the spring and of the young fruits in August and September. Infested branches should be pruned in March and September and burnt at once. Those that cannot be pruned without injury to the tree should be sprayed with milk of lime about the end of April and again 15–20 days later.

H. fraxini, Panz., is active from the second half of March until late autumn, and hibernates in the adult stage. The eggs are laid in the branches of ash and olive trees, and there are three overlapping generations a year. One main reason for the spread of this Scolytid in olive groves is the practice of using supports of ash for grape-vines. Though it has a number of natural enemies, such as the Braconids, *Coeloides filiformis*, Ratz., and *Dendrosoter protuberans*, Nees, *Eupelmus degeeri*, Dalm., *Eurytoma flavoscapularis*, Ratz., *Pteromalus fraxini*, Ratz., etc., control measures are necessary. The best consists in pruning at the end of February or early in March, the prunings being left on the ground until the end of April, when they are destroyed.

Another Scolytid, *Comesiella sicula*, gen. et sp. n., all stages of which are described, has long been a pest of olives in Sicily, but did not attract attention until recent years. The overwintered larvae pupate in March, and the first adults appear in April. A female may lay 20–25 eggs in about a fortnight, and in the spring they hatch in about 10 days. The number of generations a year is not known. The injury to the olive resembles that done by *Hylesinus*. In the autumn or winter

all infested twigs should be destroyed. Infestations in larger branches or the trunk should be painted with a tar insecticide. Oviposition may be prevented by two applications of milk of lime, the first when egg-laying begins and the second 15 days later.

Del Guercio (G.). **Il Pidocchio nero, Ver noir o Barban dell'Olivo** (*Phloeothrips oleae* **Costa) ed i suoi rapporti con i Punteruoli.** [*Liothrips oleae* and its Relations with the Scolytid Olive Borers.]—*Redia*, xix, pp. 75–195, 37 figs. Florence, 31st March 1931.

A full account is given of the bionomics of *Liothrips* (*Phloeothrips*) *oleae*, Costa, in Italy, and all stages are described in detail. Both larvae and adults attack the leaves and young fruits of the olive. In Liguria there are three generations a year, hibernation occurring in the adult stage. The incubation period varies with the season from about 3½ days to 1–2 weeks. The pro-nymphal and nymphal stages usually occur in cavities made by bark-beetles, *Clinodiplosis oleisuga*, Targ., and other olive pests, and the adults also conceal themselves there, and generally oviposit in the holes made in the branches by the Scolytids.

Natural enemies of *P. oleae* include spiders and various predacious Thysanoptera, and the larvae of a Cecidomyiid, *Diplosis fleothripetiperda*, sp. n., attack the larvae, but the most important is *Tetrastichus gentilei*, sp. n. All the developmental stages of this parasite are passed within the host. It hibernates as a larva or pupa, and the first adults appear in April-May and oviposit in the larvae of the thrips. Successive generations develop more rapidly than those of the host, which may be almost completely controlled in August and September. Remedial measures suggested include a spray containing 1–1½ per cent. of tobacco extract and 1–1½ per cent. of soap, a sulphur dust containing 10 per cent. of naphthalene, which is less effective, and winter pruning to destroy both the thrips and the Scolytids on which it largely depends.

Del Guercio (G.). **La Tortrice, la Limantria e la Processionea della quercia nei Boschi della Pieve a Presciano (Arezzo) dell'azienda del Sig. Conte Serristori.** [*Tortrix viridana*, *Porthetria dispar* and *Thaumetopoea processionea* in the Pieve Forests, Presciano, of the Estate of Count Serristori.]—*Redia*, xix, pp. 197–211. Florence, 31st March 1931.

This is an account of biological observations in 1921 on *Tortrix viridana*, L., in oak forests at Presciano, with a few notes on the gipsy moth [*Porthetria dispar*, L.] and the oak processionary [*Thaumetopoea processionea*, L.].

Del Guercio (G.). **Un nuovo nemico della Tignuola dell' Olivo e delle Tingidi del Pero e del Mandorlo.** [A new Enemy of the Olive Moth and of the Pear and Almond Tingids.]—*Redia*, xix, pp. 213–216. Florence, 31st March 1931.

The fungus, *Cladosporium herbarum*, is important in that it infests *Prays oleellus*, F., the most harmful pest of the olive in Italy, and also destroys Tingids occurring on pear and almond.

PAPERS NOTICED BY TITLE ONLY.

[LEVCHUK (Yu. F.).] **Левчук (Ю. Ф.). Contributions to the comparative Anatomy of the Genitalia of Elateridae.** [*In Russian.*] —*Rev. russe Ent.*, xxiv, no. 3–4, pp. 135–155, 74 figs., 9 refs. Moscow, 1930. (With a Summary in English.) [Recd. Aug. 1931.]

[PYATNITZKIĬ (G. K.).] **Пятницкий (Г. К.). Additions au travail de M. V. Starck "Les scolytiens du littoral de la Mer Noire"** [comprising records of Scolytids from Transcaucasia]. [*In Russian.*]—*Rev. russe Ent.*, xxiv, no. 3–4, pp. 162–165, 2 figs., 1 ref. Moscow, 1930. [Recd. Aug. 1931.]

SCHEDL (K. E.). **Notes on the Genus** *Xyleborus*, **Eichh.** [including 6 new species].—*Ann. Mag. Nat. Hist.*, (10) viii, no. 46, pp. 339–347. London, October 1931.

MURAYAMA (J.). **Révision des familles des Ipides et Platypides (Coléoptères) de l'Ile de Quelpart** [with a list of food-plants].—*Annot. zool. jap.*, xiii, no. 2, pp. 39–56, 2 pls., 80 refs. Tokyo, 25th May 1931.

SAITO (K.). **The more important injurious Forest Insects in Korea** [221 species, with brief notes on bionomics]. [*In Japanese.*]—*Bull. Agric. For. Coll. Korea*, no. 4, pp. 1–81, 4 pls. Suigen, Korea, 1931. (With a Summary in English.)

KITAO (Z.). **Untersuchungen über die Larve der Kiefernblattwespe,** *Nesodipron* [*sic*] *japonica* **Marlatt.** [Investigations on the Larva of the Pine Sawfly, *Diprion* (*Neodiprion*) *japonicus.*]—*J. Coll. Agric. Imp. Univ. Tokyo*, xi, no. 2, pp. 151–191, 78 figs., 49 refs. Tokyo, 28th March 1931.

KUWANA (I.) & MURAMATSU (K.). **A new Scale Insect of the Genus** *Aspidiotus* [*chinensis*, sp. n.] **found on** *Cymbidium faberi* **in China.** [*In Japanese.*]—*J. Plant Prot.*, xviii, pp. 335–338, 1 pl. Tokyo, 1931. (With a Summary in English.)

NOGUCHI (T.). **Report of Researches on** *Prontaspis yanonensis* **Kuw.** [on *Citrus* in Japan]. [*In Japanese.*]—*Extra Rep. Shizuoka Agric. Expt. Sta.*, no. 11, pp. 1–40; no. 16, pp. 1–28. Shizuoka, 1931. [*Cf. R.A.E.*, A, xvi, 627.]

TAKAHASHI (R.). **A new** *Mindarus* [*japonicus*, sp. n., on *Abies* sp.] **from Japan (Aphididae).**—*Trans. Nat. Hist. Soc. Formosa*, xxi, no. 114, pp. 137–139, 2 figs. Taihoku, June 1931.

TAKAHASHI (R.). **Some Aphids from Hangchow, China.**—*Proc. Nat. Hist. Soc. Fukien Christian Univ.*, iii, reprint 1 p. Foochow, August 1930. [Recd. July 1931.] [*Cf. R.A.E.*, A, xvi, 691.]

HOTTES (F. C.). **Notes concerning the first Papers dealing with the Aphid Fauna of America.**—*Proc. Biol. Soc. Washington*, xliv, no. 17, pp. 61–70, 2 refs. Washington, D.C., 29th June 1931.

DOBROSCKY (I. D.). **Morphological and cytological Studies on the salivary Glands and alimentary Tract of** *Cicadula sexnotata* **(Fallen), the Carrier of Aster Yellows Virus.**—*Contr. Boyce Thompson Inst.*, iii, no. 1, pp. 39–58, 7 figs., 18 refs. Yonkers, N.Y., March 1931.

SHERWOOD (E. C.). **Raising the Community Score by controlling Insects and fungous Diseases.**—*Extens. Circ. W. Virginia Coll. Agric.*, no. 294, 35 pp., 11 figs. Morgantown, W. Va., February 1930. [Recd. Sept. 1931.] [*Cf. R.A.E.*, A, xiv, 490.]

BARNES (H. F.). **Notes on the Outbreak of the Cabbage Aphid** (*Brevicoryne brassicae* **Linn.) in 1929.**—*J. S.-E. Agric. Coll.*, no. 28, pp.178–180, 1 graph. Wye, Kent, 1931. [*Cf. R.A.E.*, A, xix, 404.]

HOOPER (C. H.). **Insect Visitors to Fruit Blossoms.**—*J. S.-E. Agric. Coll.*, no. 28, pp. 211–215, 9 refs. Wye, Kent, 1931. [*Cf. R.A.E.*, A, xix, 375.]

MASSEE (A. M.). **The Tarsonemid Mite** [*Tarsonemus fragariae*, Zimm.] **of Strawberry.**—*16th-18th Ann. Rep. East Malling Res. Sta.*, 1928–30, pt. 2 (suppl.), pp. 206–209, 1 pl., 3 refs. East Malling, Kent, April 1931. [See *R.A.E.*, A, xix, 177.]

MASSEE (A. M.). **The relative Value of Tar-distillate Washes, Spring Washes and Grease-banding in any Scheme of Insect Control.**—*Ann. Rep. East Malling Res. Sta.*, 1930, xviii, pt. 1 (gen.), pp. 111–120, 1 ref. East Malling, Kent, April 1931. [*Cf. R.A.E.*, A, xix, 273.]

STANILAND (L. N.), TUTIN (F.) & WALTON (C. L.). **The Control of Capsid Bugs on Black Currants. Progress Report.**—*Rep. Agric. Hort. Res. Sta. Bristol 1930*, pp. 95–99, 2 diag., 3 refs. Long Ashton, Bristol [1931]. [See *R.A.E.*, A, xviii, 626.]

WALTON (C. L.). **The Raspberry and Loganberry Beetle** [*Byturus tomentosus*, F.] **and its Control. Further Experiments with Pyrethrum Emulsion Sprays and a Dust.**—*Rep. Agric. Hort. Res. Sta. Bristol 1930*, pp. 100–105, 1 pl., 4 refs. Long Ashton, Bristol [1931]. [See *R.A.E.*, A, xix, 178.]

JANISCH (E.). **Ueber die Grundbegriffe bei der Kausalanalyse der Insektenvermehrung.** [A Survey of the basic Conceptions (of various Authors) in the Analysis of the Causes of Increases of Insects.]—*Anz. Schädlingsk.*, vii, no. 6, pp. 61–67, 2 figs., 11 refs. Berlin, June 1931.

ROMAN (E.). **La coque de nymphose de la bruche du haricot (Col. Lariidae).** [The nymphal Cocoon of *Bruchus obtectus*, Say.]—*Bull. Soc. ent. Fr.*, 1931, no. 10, pp. 162–166, 3 figs., 4 refs. Paris, 1931.

GAUTIER (C.) & BONNAMOUR (S.). **Un nouvel** *Aphidius* **(Hym. Aphidiidae).** [*Aphidius palpator*, sp. n., on apple trees attacked by Aphids, including *Eriosoma lanigerum*, Hausm., in France.]—*Bull. Soc. ent. Fr.*, 1931, no. 10, pp. 166–167. Paris, 1931.

[BARANOV (N.).] BARANOFF (N.). **Studien an pathogenen und parasitischen Insekten III. Beitrag zur Kenntnis der Raupenfliegengattung** *Carcelia* **R. D.** [Studies on pathogenic and parasitic Insects. III. Contribution to the Knowledge of the Tachinid Genus *Carcelia* R.-D.]—*Arb. paras. Abt. Inst. Hyg. Sch. Volksgesungheit Zagreb*, no. 3, 45 pp., 7 figs. Zagreb, 1931.

GUARASCI (G.). **Intorno a una nuova gregarina** (*Pyxinia anthreni* **n. sp.) parassita nell' intestino di** *Anthrenus verbasci* **L.**—*Boll. Zool.*, ii, no. 3, pp. 85–92, 1 pl., 18 refs. Naples, 1931.

GRANDORI (R.). **Esperimento sul possibile attecchimento della** *Botrytis tenella* **Sacc. sulle larve di** *Bombyx mori* **L.** [Experiments in the possible Infection of Larvae of *Bombyx mori* with *Botrytis tenella*.]—*Boll. Lab. Zool. agrar. Bachic. Milano*, ii (1929–30), pp. 7–9. Milan, 1931.

GARGIULO (F.). **Studi e richerche sul giallume del Baco da seta.** [Studies and Researches on Polyhedral Disease of *Bombyx mori*, L.]—*Boll. Lab. Zool. agrar. Bachic. Milano*, ii (1929–30), pp. 72–115, 6 pls. 5 pp. refs. Milan, 1931.

Amtliche Pflanzenschutzbestimmungen. [Official Regulations on Plant Protection (including German regulations on the use of highly poisonous insecticides).]—*NachrBl. deuts. PflSchDienst*, Beilage, iii, no. 3, pp. 125–162. Berlin, 1st July 1931.

Del Guercio (G.). **Bupreste nero del Susino, del Pesco, del Ciliegio e di altre piante fruttifere** (*Capnodis tenebrionis* **L.**). [*C. tenebrionis*, the black Buprestid of Plum, Peach, Cherry and other Fruit Trees.]—*Redia*, xix, pp. 227–252, 18 figs. Florence, 31st March 1931.

The Buprestid, *Capnodis tenebrionis*, L., is a serious pest of fruit trees in Italy. The adults, of which 90 per cent. are females, begin to emerge in May, and in 1930 pairing was observed in July. The eggs are laid in cracks in the bark of the trunks of plum and cherry, or less frequently, in peach, pear, and other fruit-trees. The larvae infest the lower part of the trunk and top of the roots, feeding for over two years in the cortical tissues and sapwood and pupating in April and May. The adults attack the leaf-stems and the bark of branches that they have defoliated. This Buprestid is favoured by an almost complete absence of natural enemies, but a species of *Entomococcus* [*R.A.E.*, A, xvii, 687] kills all stages. All infested trees should be uprooted and burnt before new ones are planted, blackthorn trees (*Prunus spinosa*) in the vicinity being also destroyed, as they are a source of infestation.

Del Guercio (G.). **La vespina che libera il pomario dalla Schizoneora del Melo e del Pero e salva diecine di milioni all'economia nazionale** (*Aphelinus mali* **Hald.**). [The Parasite that frees Orchards from the Woolly Aphis of Apple and Pear and saves Italy many Millions of Lire.]—*Redia*, xix, pp. 253–307, 4 pls., 2 figs. Florence, 31st March 1931.

Descriptions are given of the various forms of the woolly aphis [*Eriosoma lanigerum*, Hausm.], with notes on their occurrence in Italy, the greater part of the paper being devoted to an account of the parasite, *Aphelinus mali*, Hald., and its establishment in that country.

Del Guercio (G.). **Osservazioni intorno al Gen.** *Anuraphis* **Del Guercio.** [Notes on the Genus *Anuraphis* Del Guerc.]—*Redia*, xix, pp. 309–501, 103 figs. Florence, 31st March 1931.

The classification of the genus *Anuraphis* is discussed, with morphological and biological notes, and a list is given of the species, each of which is described.

Del Guercio (G.). **La** *Icerya purchasi* **e l'insetticida occorrente per distruggerla.** [*I. purchasi* and the Insecticide required to destroy it.]—*Redia*, xix, pp. 503–513, 4 figs. Florence, 31st March 1931.

The Coccinellid, *Novius cardinalis*, Muls., imported into Italy against *Icerya purchasi*, Mask., occasionally fails to control isolated infestations. In such cases a spray of kerosene emulsion has been found very effective. It is prepared by boiling 10 lb. soft soap in 1 gal. water until a homogeneous mixture is obtained, after which 2 gals. kerosene are gradually added and the whole stirred until a creamy liquid is formed. This is then

diluted with 6 gals. water. It is stated that this emulsion has been used for over three years and applied at the height of summer without causing any injury to leaves, flowers or fruit of *Citrus* or to a great variety of other plants [although the percentage of oil in it is greater than is usually considered safe for plants in leaf—Ed.].

Brites (G.). **Observations sur les pupes du** *Dacus oleae* **Rossi incluses dans les olives.**—*Mem. Estud. Mus. zool. Univ. Coimbra,* Ser. ii, no. 3, 5 pp. Coimbra, 1930. [Recd. July 1931.]

It is known that the olive-fly, *Dacus oleae*, Gmel., can pupate in the larval mines in the fruits. Examinations of olives picked near Coimbra at different dates from October to January lead to the conclusion that such pupation is exceptional. In the laboratory some larvae pupated in the fruits in November, December and January, probably because the temperatures were higher and more uniform than in the field where pupae are not found in the fruits in these months.

Brites (G.). **Notes pour la détermination de la durée de la pupe de la mouche de l'olive de la génération de l'automne et du commencement de l'hiver.**—*Mem. Estud. Mus. zool. Univ. Coimbra,* Ser. ii, no. 4, 6 pp. Coimbra, 1930. [Recd. July 1931.]

The duration of the pupal stage of *Dacus oleae*, Gmel., has never been ascertained in Portugal. In the autumn and early winter of 1929 olives were collected near Coimbra at various dates, and pupal periods of from 7 to 76 days were observed. The adults from each batch of pupae emerged in two groups, the second and smaller one appearing after an interval of from 4 to 19 days.

de Seabra (A. F.). **Sôbre a morte das " Tuias " do Parque das Pedras Salgadas e existência em Portugal de** *Orsillus depressus* **Muls. et Rey. (Hemíptero-Heteróptero.)** [The Death of *Thuja* Trees in the Pedras Salgadas Park and the Occurrence in Portugal of *O. depressus*.]—*Arq. Secç. Biol. Paras. Univ. Coimbra,* i, no. 3, pp. 155–158, 2 figs., 2 pls. Coimbra, 1930. [Recd. July 1931.]

A Lygaeid, *Orsillus depressus*, Muls. & Rey, is recorded as contributing to the death of many trees of *Thuja gigantea* that were in poor condition owing to unsuitable environmental conditions at Pedras Salgadas, Portugal.

de Seabra (A. F.). **Registo das espécies úteis ou nocivas observadas na Secção de Biologia e Parasitologia do Museu durante os meses de Janeiro a Março de 1930.** [A List of useful or harmful Species recorded by the Section of Biology and Parasitology of the Museum of the University of Coimbra in January–March 1930.]—*Arq. Secç. Biol. Paras. Univ. Coimbra,* i, no. 3, pp. 261–266. Coimbra, 1930. [Recd. July 1931.]

This list includes *Iridomyrmex humilis*, Mayr, which was probably imported into Portugal about 48 years ago, and has become abundant in some localities.

ROHDENDORF (B.). **Records of Tachinidae (Larvaevoridae), with new African Species (Dipt.).**—*Ann. Mag. Nat. Hist.*, (10) viii, no. 46, pp. 347–351, 5 figs. London, October 1931.

Among the species dealt with are *Sarcophaga furcadorsalis*, sp. n., and *Blaesoxipha filipjevi aequatorialis*, Rohd., both bred from adults of *Locusta migratoria migratorioides*, R. & F., in Sierra Leone.

MYERS (J. G.). **A preliminary Report on an Investigation into the Biological Control of West Indian Insect Pests.**—*E.M.B.* 42, 172 pp., 2 maps, 17 pp. refs. London, H.M. Stationery Office, July 1931. Price 1*s.* net.

This report presents briefly the preliminary results of an investigation begun in the West Indies in November 1928.

The following is taken from the author's summary: During eighteen months actually spent in the field, 17 major pests were investigated, and numerous observations were conducted on ecological conditions. The most important pests of sugar-cane in the region as a whole are *Diatraea* spp. (small moth-borers), only two parasites of which have proved efficient. *Lixophaga diatraeae*, Towns., which is the more effective, is apparently ecologically suited only to the conditions prevailing in the northern islands, and has accordingly been introduced into Barbados and Antigua, whence it will probably be taken later to St. Kitts and St. Lucia. The other, *Paratheresia claripalpis*, Wulp, occurs already in all areas where it is likely to thrive, except the Berbice province of British Guiana and the island of St. Lucia, into both of which it may be introduced later. A more efficient parasite is meanwhile being sought for on the mainland for introduction into Trinidad and British Guiana.

Castnia licoides, Boisd. (large moth-borer of cane), since it is controlled by flooding in British Guiana, is now a serious pest only in Trinidad, where, however, it is widespread and increasing. Although no parasite is at present known, the discovery of the original food-plant (*Heliconia bihai*) will facilitate further search. *Tomaspis saccharina*, Dist., remains a pest of primary importance in Trinidad, and *Carabunia myersi*, Wtrst., an efficient froghopper parasite in Cuba [*R.A.E.*, A, xix, 27] was found not to attack froghoppers of this genus. It is hoped to discover an effective parasite on the mainland. An effective egg parasite of two weevils allied to *Diaprepes abbreviatus*, L., has been studied in Haiti and Montserrat with a view to its introduction into Barbados, where this root-borer is a serious pest of sugar-cane.

Selenothrips (*Heliothrips*) *rubrocinctus*, Giard (cacao thrips) has been studied in Trinidad and Haiti, and in Jamaica, where a new, though not very effective, Capsid predator was discovered. *Stirastoma depressum*, L. (cacao beetle) was investigated in the Guianas, and six of its parasites were studied in Trinidad, but a more effective one is needed and will be sought for in Ecuador. A study of the true wild cacao (*Theobroma cacao*) in Dutch Guiana showed that neither *Selenothrips* nor *Stirastoma* is a pest of the wild tree, each having become attached to it since its cultivation in the coastlands.

Platyedra gossypiella, Saund. (pink bollworm), which was introduced into the British West Indies in 1920 and became a serious pest, has lately decreased to negligible importance. A promising new parasite, *Apanteles* sp., has been discovered in Trinidad. Little success can be

hoped for in attempts to control *Alabama argillacea*, Hb., by biological methods until the focus from which it makes its annual migrations north and south of the equator has been discovered. As *Dysdercus* spp. (cotton stainers) are shown to have no effective natural enemies in the West Indies, the introduction of Tachinid flies [*R.A.E.*, A, xvi, 532] from Queensland or Nigeria is suggested. About 8 per cent. of the adults of *Nezara viridula*, L., which is important not only as a pest of cotton but also of tomato, etc., were found to be destroyed by the Tachinid, *Trichopoda pilipes*, F., but a more efficient parasite is being sought.

Hypsipyla spp. (mahogany shoot borers) are the most important pests of forestry in British Honduras and Trinidad, and at least 5 species of parasites have been discovered and studied. A Chalcid, *Euplectrus* sp., and a Tachinid, two new parasites of *Calpodes ethlius*, Cr., which attacks arrowroot, the principal crop of St. Vincent, have been found in Cuba.

No parasites of *Euscepes batatae*, Waterh., which is the worst pest of sweet potatoes wherever it occurs in the West Indies, are known, and search for them has hitherto been unsuccessful. It is suggested that attempts should be made to find parasites of *Cosmopolites sordidus*, Germ. (banana borer) in New Guinea, as it is not likely that any occur in the American tropics where the borer is not indigenous. No natural enemies of *Leucoptera coffeella*, Guér., were found in the course of an investigation in St. Lucia, and it is hoped to introduce a parasite from Venezuela or Porto Rico, where several are known to occur, the most promising being the Eulophid, *Chrysocharis lividus*, Cress. A number of minor pests were studied during other operations.

Newcomer (E. J.), Yothers (M. A.) & Whitcomb (W. D.). **Control of the Codling Moth in the Pacific Northwest.**—*Fmrs'. Bull. U.S. Dept. Agric.*, no. 1326 revd., 26 pp., 1 fldg. diag., 18 figs. Washington, D.C., March 1931.

This is a revision of previous bulletins on the control of the codling moth, *Cydia* (*Carpocapsa*) *pomonella*, L. [*R.A.E.*, A, xii, 247 ; xviii, 384], the principal additional information dealing with the use of oil emulsions combined with lead arsenate sprays against the first brood or with nicotine sulphate against the second.

Edwards (W. H.). **Report of the Government Entomologist.**—*Ann. Rep. Dept. Agric. Jamaica 1930*, pp. 20–21. Kingston, 1931.

In Jamaica, experiments with insecticides against Lepidopterous larvae attacking cucurbits and solanaceous plants indicate that lead arsenate is definitely superior to calcium arsenate, the latter causing serious injury to plants treated during active growth. Submersion of infested banana suckers in water for the control of *Cosmopolites sordidus*, Germ., has proved impracticable, partly because, contrary to what appears to happen elsewhere, the conditions prevailing in the local streams cause a large percentage of the suckers so treated to be ruined by soft rots before the borers are destroyed. Against Coccids attacking *Citrus*, tar distillate sprays gave good results, but their cost is prohibitive. Experiments in tent fumigation with hydrocyanic acid gas showed that the treatment can be carried out in daylight in the autumn. It is considered that the practice of using the ant,

Cremastogaster brevispinosa, Mayr, var. *minutior*, For., as a means of controlling *Aleurocanthus woglumi*, Ashby, should be abandoned, since although it destroys the Aleurodid, it disseminates scale-insects, particularly *Coccus viridis*, Green, in the groves in which it has been introduced.

A list of the pests dealt with during the year is appended.

Cleare, jr. (L. D.). **Report of the Entomological Division for the Year 1930.**—*Admin. Rep. Dir. Agric. Br. Guiana 1930*, pp. 87–90. Georgetown, 1931.

Coconut pests in British Guiana in 1930 included *Brassolis sophorae*, L., which caused serious injury in one plantation owing to neglect of proper control measures at the beginning of the outbreak ; *Castnia daedalus*, Cram. ; and *Tropidacris latreillei*, Perty, the nymphs of which attacked coconuts growing over an area of about 10 acres without causing severe injury. As is usual, this locust had previously been feeding on *Quassia*, from which it migrated to the coconuts. The damage caused by *Calandra* (*Sitophilus*) *oryzae*, L., in rice mills is being investigated ; the export of rice infested by it has been prohibited.

Frederick (H. J.). **Feeding Value of Alfalfa Hay treated with Calcium Arsenate.**—*Bull. Utah Agric. Expt. Sta.*, no. 223, 8 pp., 4 figs., 3 refs. Logan, Utah, December 1930. [Recd. September 1931.]

This bulletin records investigations undertaken to ascertain the feeding value of hay from lucerne treated with calcium arsenate against the alfalfa weevil [*Hypera variabilis*, Hbst.]. It is concluded that lucerne dusted with 2 lb. calcium arsenate to the acre may be fed to livestock with impunity for at least one feeding season (4–6 months).

Knowlton (G. F.) & Janes (M. J.). **Notes on some beneficial Utah Diptera.**—*Proc. Utah Acad. Sci.*, viii, pp. 147–148. Salt Lake City, 1931.

An annotated list is given of a number of predacious and parasitic Diptera occurring in Utah, including *Pipunculus subvirescens*, Lw., a parasite of *Eutettix tenella*, Bak. ; six species of *Sarcophaga* parasitic on grasshoppers, and four on other insects ; *Scatophaga merdaria*, F., predacious on leafhoppers ; and *Chloropisca glabra*, Mg., the larvae of which attack Aphids, including *Pemphigus betae*, Doane, a common pest of sugar-beet.

Knowlton (G. F.). **Notes on the Biology of *Microbracon hebetor* (Say).**—*Proc. Utah Acad. Sci.*, viii, pp. 149–150. Salt Lake City, 1931.

In the course of observations in Utah on the biology of *Microbracon hebetor*, Say, a parasite of Lepidopterous larvae, especially those infesting stored grain and dried fruit, most of the parasites were reared on *Ephestia kühniella*, Zell., and some on *Galleria mellonella*, L. They developed successfully on *Cydia* (*Carpocapsa*) *pomonella*, L., in 3 cases out of 18 attempted, and in one instance on unidentified Hymenopterous larvae removed from willow twig galls. The laboratory technique and the method of egg-laying are briefly discussed. Females deposited

from 31 to 295 eggs each, the average for 11 individuals being 132. Eggs from unfertilised females always gave rise to males, whereas more females than males matured from those laid by fertilised ones. The larvae hatched in 1–4 days and fed for 1·5–7, after which they abandoned their hosts and spun cocoons, pupating 1–2 days later. The pupal stage lasted 4–10 days. The time required to complete development from egg to adult varied from 8 to 18 days and averaged 11. As many as 12 parasites completed development on one larva of *E. kühniella*, and 16 on one of *G. mellonella*. An average of 5·9 parasites to a host emerged from 98 larvae. The pre-oviposition period usually lasted 2–4 days, the oviposition period for 11 females averaging 13 days, with a maximum of 21.

Snapp (O. I.) & Thomson (J. R.). **The Control of the Lesser Peach Borer with Paradichlorobenzene Solutions.**—*Circ. U.S. Dept. Agric.*, no. 172, 11 pp., 2 figs., 6 refs. Washington, D.C., July 1931.

An account is given of experiments carried out from 1928 to 1930 against *Aegeria* (*Synanthedon*) *pictipes*, G. & R. (lesser peach borer) on peaches in Georgia ; some of the results of the first two years' work have already been noticed [*R.A.E.*, A, xviii, 580]. Of the materials tested as solvents for paradichlorobenzene, crude cottonseed oil (2 U.S. qts. to 1 lb.) was the most satisfactory, 93·4–97·9 per cent. control being obtained when the wash was applied with a brush about 1st April to infested areas. For the best results it must be applied a few inches beyond the indications of attack, and the areas thoroughly soaked. Though treatments in April may result in slightly better control than those in October, they permit the borers to work during the autumn and warm periods of the winter. The wash can apparently be stored in a closed container without any loss of paradichlorobenzene. Recrystallisation in the wash takes place when it is cold, but the crystals disappear in warm weather.

Sprays of paradichlorobenzene and crude cottonseed oil emulsified with water were not so effective as the wash applied with a brush. Cottonseed oil was a more suitable solvent for paradichlorobenzene than mineral oils, from which it evaporated more quickly, linseed oil or maize oil. No discernible injury to the trees resulted from the use of any of these materials.

Decker (G. C.). **The Biology of the Stalk Borer** *Papaipema nebris* **(Gn.).**—*Res. Bull. Iowa Agric. Expt. Sta.*, no. 143, pp. 289–351, 22 figs., 42 refs. Ames, Iowa, June 1931.

A detailed account is given of the bionomics and control of *Papaipema nebris*, Gn. (*nitela*, Gn.) [*cf. R.A.E.*, A, xvii, 43], based on investigations in Iowa during 1926–30, with descriptions of all stages and notes on its history, distribution and synonymy, and a list of its food-plants. Although it normally feeds on *Ambrosia trifida*, it occasionally causes considerable injury to maize and other crops.

Oviposition occurs at night from mid-August until early in October, the eggs being laid singly or in masses of from 2 to 100 on the leaves and stems of dead grasses and weeds. The egg stage lasts 7½–8½ months, hatching normally occurring during the first half of May. The larvae tunnel into the nearest available food-plants, where they feed until they either kill or outgrow them, when they

migrate to new ones. Under field conditions the larval period varied from 60 to 130 days. Pupation usually takes place just below the surface of the soil, but occasionally when the larvae are feeding on maize, etc., at the base of the feeding burrow in the stalks. The pupal period is greatly influenced by climatic conditions, lasting from 16 to 40 days with an average of about 25. The adults emerge from early August until the first week in October ; they are not attracted to sweetened baits.

Adverse climatic conditions and natural enemies play an important part in holding this Noctuid in check. Predators include various Carabids, Coccinellids and Rhynchota, of which the Pentatomid, *Podisus maculiventris*, Say, is the most important. The Tachinid, *Ceromasia* (*Masicera*) *senilis*, Mg., which attacks up to 70 per cent. of the larvae, is the most effective parasite. Its pupal period averages about 14 days, the adults emerging from 1st July to mid-September. It probably hibernates in the larval stage on some alternative host. *Eupteromalus dubius*, Ashm., and *Perilampus hyalinus*, Say, were reared from its puparia. Other Dipterous parasites are *Winthemia quadripustulata*, F., which, however, only attacks *P. nebris* in the absence of other hosts (cutworms), parasitising from 12 to 21 per cent. of the larvae, *Muscina stabulans*, Fall., *Lixophaga variabilis*, Coq., *Sarcophaga rapax*, Wlk. (*helicis*, Tns.), *S. setulosa*, Wulp (*cimbicis*, Tns.), and *Gymnochaeta ruficornis*, Will., which hibernates as a pupa, the adult emerging in May. Hymenopterous parasites include the Braconids *Apanteles papaipemae*, Mues., which may frequently infest up to 38 per cent. of the larvae, *Microplitis gortynae*, Riley, *Microbracon caulicola*, Gah., and *M. furtivus*, Fyles, and the Ichneumonids, *Lissonota brunnea*, Cress., and *Amblyteles jucundus*, Brullé. In the insectary some larvae were killed by *Cordyceps* sp., and another fungus, *Metarrhizium anisopliae*, was common on both larvae and pupae.

SWEETMAN (H. L.). **The Mexican Bean Beetle.**—*Bull. Wyoming Agric. Expt. Sta.*, no. 176, 21 pp., 12 figs., 6 refs. Laramie, Wyo., January 1931.

An account is given of *Epilachna corrupta*, Muls. (Mexican bean beetle) as occurring in Wyoming. The effects of temperature and moisture on the incidence of the beetle are discussed, largely from data already noticed [*R.A.E.*, A, xviii, 492]. Over the greater part of Wyoming the climate is very dry, and the beetle is at present limited to irrigated areas. These may serve as centres of infestation that would become extremely important in years when climatic conditions became favourable for dispersal to the drier localities. The insecticide recommended is magnesium arsenate as a spray or dust [xviii, 346].

HOUGH (W. S.), HURT (R. H.), ELLETT (W. B.), EHEART (J. F.) & GROVES (A. B.). **Removal of Spray Residue from Apples.**—*Bull. Virginia Agric. Expt. Sta.*, no. 278, 16 pp., 5 figs., 3 refs. Blacksburg, Va., June 1931.

The following is almost entirely taken from the authors' conclusions : In Virginia it was found that three sprays of 3 lb. lead arsenate in 100 U.S. gals. water applied to apples in May and June did not necessitate the removal of spray residue from fruit picked in September. A spray applied during the first half of July, however, may leave an

excess of arsenic on the fruit if followed by dry weather for the remainder of the season. A spray applied in late July left such an excess for the remainder of the season, although rainfall greatly exceeded the normal for August and September. Approximately half the arsenical residue is distributed on the side of the apple, the remainder being in the calyx and stem ends. Wiping or brushing resulted in the removal of approximately one-third of the total arsenical residue. Washing in dilute hydrochloric acid solution removed excessive arsenical residue. For each bushel of washed fruit, 1 U.S. gal. of fresh rinse water, delivered through spray nozzles, removed traces of acid from the fruit; from 3 to 5 U.S. gals. of fresh water were used each minute in this way. A machine for wiping and drying washed fruit by towels is illustrated; this proved more satisfactory than air drying as it also removed specking caused by leafhoppers and smears from fungicides or dust. Washed fruit kept as well as unwashed fruit when packed and stored in barrels or baskets.

STEWART (F. C.) & GLASGOW (H.). **Aphids on Potato Sprouts.**—*Circ. New York St. Agric. Expt. Sta.*, no. 119, 6 pp., 2 figs. Geneva, N.Y., 1931.

This is a popular account of investigations previously recorded [*R.A.E.*, A, xix, 265] on the occurrence of *Myzus persicae*, Sulz., on sprouting potato tubers in Geneva, New York, and the transmission of leaf-roll by it.

REGAN (W. S.). **Results of Insecticide Tests for the Control of Codling Moth and Observations on Codling Moth Activity during the Season of 1930 in the Yakima Valley, Wash.**—22 pp. Berkeley, Cal., Calif. Spray Chem. Co., 1931.

This paper records the results of 28 tests with various materials, chiefly proprietary, for the control of the codling moth [*Cydia pomonella*, L.] on apples in Washington State. Although the tests indicate that the addition of spreaders of the "film-building" or colloid type to ortho lead arsenate does not apparently increase its effectiveness, their use is considered advantageous in giving even coverage as a foundation for later sprays, and also in preventing possible liberation of arsenic. A high degree of control was obtained with 2 lb. lead arsenate and 3⅓ U.S. qts. of a proprietary summer oil (67 to 75 seconds viscosity, 92–94 sulphonation test) in 100 U.S. gals. of spray and somewhat better results with the addition of a spreader or hydrated lime. The use of 1 lb. hydrated lime in 100 U.S. gals. appeared to give better results than ½ lb. Reduced dosages of the lead arsenate (1⅓ lb. in 100 U.S. gals.) in the last four of the six applications also produced good results. Nicotine sulphate (40 per cent.) with the oil instead of lead arsenate in late sprays gave sufficiently good control to indicate the possibility of using this material where residue removal is a serious problem. Crude coal-tar creosote, which has been used as an orchard spray in Yakima for several years, when used in combination with lead arsenate, was found to reduce rather than increase the effectiveness of the arsenical, and showed no noticeable effect as an ovicide or repellent. Moreover, it caused drying and dwarfing of the leaves, with some scorching, and a reduction in the size of the fruit.

The records of captures of moths by bait traps are discussed ; a study of the relation of evening temperatures to flight and larval activity showed that relatively low temperatures during late September and October, following an abundance of moths in late August and early September, reduced considerably the degree of infestation in fruit.

DITMAN (L. P.) & CORY (E. N.). **The Corn Earworm : Biology and Control.**—*Bull. Maryland Agric. Expt. Sta.*, no. 328, pp. 443–482, 11 figs., 11 refs. College Park, Md., June 1931.

A detailed account is given of the results of six years' work on the bionomics, seasonal history and control of *Heliothis* (*Chloridea*) *obsoleta*, F., on maize in Maryland. All stages are described and characters distinguishing the sexes in the pupal stage are indicated, this not having previously been done for a Noctuid pupa.

Hibernation occurs in the pupal stage, and the moths emerge in late spring and early summer. The eggs are laid on almost any part of the plant, except the lower surface of the leaves where there are no hairs. About 70 per cent. are laid on the silks, but many ears are infested before silking. The incubation period lasts about 3–5 days. The larvae seem unable to feed on the large outer leaves of the young plants and experience difficulty in reaching the young portions of the stalk. If they fall from the plant, they may gain sufficient size and strength to return to it by feeding on weeds. Migration may take place, particularly during heavy infestations. The larvae may mature in the silks, eat their way down into the ear or enter the ear through the tender husk. There is considerable mortality in the immature stages. During 1928 only 50 per cent. of the eggs hatched, the mortality increasing as the season advanced. When hatching occurs before tasselling, many of the young larvae die, probably less than 5 per cent. surviving on young plants. The older ones develop pronounced cannibal tendencies. Mortality during the pupal period is high, particularly during hibernation [*cf. R.A.E.*, A, xviii, 583]. Natural enemies observed included various predacious Rhynchota, Coccinellids and Chrysopids, and the egg-parasite, *Trichogramma minutum*, Riley.

Under optimum conditions the life-cycle lasts 30 days, though in Maryland only two broods could develop at this rate. Theoretically, in the southern part of the State, three broods and, during an exceptionally long summer, a partial fourth are produced. Owing, however, to the long period of emergence of adults from overwintering pupae, the broods are not distinct during the summer, and the timing of control measures should therefore be based on the development of the food-plant.

In experiments no satisfactory baits or repellents for the moths were found, and sprays of contact or stomach poisons proved valueless. Some reduction in the percentage of infestation was obtained with dusts, of which lead arsenate gave the most satisfactory results, and also by removing the silks, but this adversely affected fertilisation.

COAD (B. R.). **Insects captured by Airplane are found at surprising Heights.**—*Yearb. U.S. Dept. Agric.*, 1931, pp. 320–323, 4 figs. Washington, D.C., 1931.

A brief outline is given of the results obtained in connection with investigations on the migration of insects, particularly those affecting the cotton crop, conducted by means of aeroplanes equipped with special

insect collecting traps. The trap consists of two insect proof compartments, with an open section between them, and these contain a series of screen trays, 1 ft. square, treated with an adhesive. They are arranged in such a manner that any tray may be pulled out to the centre section and exposed to the air for any desired length of time. Since it was found that meteorological conditions as well as the time of the day influenced the results obtained, systematic series of flights were carried out in a number of localities at various times of the year and day. Collections were made at altitudes ranging from 50 to 14,000 ft., the densest population being found to occur in the first 1,000 ft. Counts from several hundreds of collections, made in one locality in Louisiana, show that under all conditions for all seasons of the year an average of about 25 million insects is found in the upper air over 1 square mile of ground. Generally speaking large, strong flying insects are collected closer to the earth, and smaller, weaker ones at higher altitudes; thus the cotton leaf-worm moth [*Alabama argillacea*, Hb.] usually occurs within 3,000 ft. of the ground. The boll weevil [*Anthonomus grandis*, Boh.] has been found as high as 1,000 ft., the tarnished plant bug [*Lygus pratensis*, L.] and the pink boll worm [*Platyedra gossypiella*, Saund.] up to 3,000, and the cotton flea-hopper [*Psallus seriatus*, Reut.] up to 5,000 ft. Such insects as leafhoppers occur up to 7,000 ft. and minute parasitic flies, Aphids, etc., up to 14,000 ft.

CARTER (R. H.). **Determination of Barium Fluosilicate Spray Residue.** —*Indust. Engng. Chem.*, Analytical Edn., iii, p. 146 (reprint 4 pp.). Easton, Pa., April 1931.

A description is given of a method for determining the residue of barium fluosilicate on sprayed apples, as barium sulphate, the residue being obtained for analysis by washing the apples in a dilute solution of sodium hydroxide.

JONES (H. A.). **Decomposition of Rotenone in Solution.**—*Indust. Engng. Chem.*, xxiii, p. 387 (reprint 3 pp.), 4 refs. Easton, Pa., April 1931.

JONES (H. A.) & HALLER (H. L.). **The "Yellow Compounds" resulting from the Decomposition of Rotenone in Solution.**—*J. Amer. Chem. Soc.*, liii, pp. 2320–2324, 13 refs. Easton, Pa., June 1931.

In these two papers the decomposition of rotenone in solution in certain solvents is discussed [*cf. R.A.E.*, A, xix, 357]. Investigation has proved that the changes are due to the oxidation of the rotenone by the air, the rate being accelerated by greater exposure to it. A chemical examination of the yellow crystalline product of decomposition has shown it to be a mixture of dehydrorotenone and rotenonone, both oxidation products of rotenone, but the reaction continues beyond the formation of these two compounds and results in a complex mixture of other oxidation products. Similar changes are undergone by dihydrorotenone and isorotenone in pyridine solution, and doubtless analogous compounds are formed.

The pyridine solution decomposed most rapidly, and the solution in acetone with tannic acid also decomposed very rapidly. Chloroform and ethylene dichloride solutions darkened slowly at first, but after a few days showed fairly rapid decomposition. Solutions in acetone,

diacetone alcohol and dichlorobenzene (a technical mixture of ortho- and para-dichlorobenzenes) showed comparatively slow decomposition. Of the solvents in which rotenone was completely soluble, benzene gave the least decomposition. Solution was not complete in alcohol, water or kerosene. The mixture in alcohol showed only slight colouration at the end of a month, and mixtures in water and in kerosene showed no colouration after standing for several months. The decomposition varies also with the concentration of the solution, solutions of lower concentrations, in pyridine, changing colour more rapidly. Solutions of rotenone should therefore be freshly made, or if they are required to stand for a long time, they should be kept in air-tight containers. Rotenone should be stored and transported in the dry state whenever possible, as dry rotenone undergoes no decomposition.

Wood (A. A.). **A new Bait Trap for Noctuid Moths.**—*Canad. Ent.*, lxiii, no. 7, pp. 149–150. Orillia, Ont., July 1931.

This trap consists of a rectangular screened cage 18 by 19 ins. and 18 ins. high with a sheet metal top projecting $1\frac{1}{2}$ inches. In each side are three horizontal openings, 6 ins. by about $\frac{5}{8}$ in., through which the moths pass to reach the bait. The bait box is a metal container 4 ins. wide, 8 ins. long and $1\frac{5}{8}$ ins. deep. The lids are of screening hinged on the outer side and fail to meet in the centre by $\frac{1}{4}$ inch, to form an aperture for a wick. L-shaped pieces of band iron are slotted into the underside of the metal top, holes being drilled in them about 1 in. from the top through which passes an iron rod from which to hang the wick. This is made of heavy flannel, 7 ins. wide. A wire with a hook at each end is passed through a hem at the top to attach the wick to the cross rod. Before the wick is placed in position, it is well soaked in water, and then saturated with a mixture consisting of 1 pt. molasses, 2 oz. fermented apple juice, 10 drops pear essence, 10 drops lavender essence and 2 drops anise essence, 6 oz. of the mixture being placed in the container. The bait boxes with bait and wicks are stored in a covered metal tray for several days before using to hasten fermentation, and when the traps are in use they are stored in a metal box during the day to prevent evaporation. The traps are hung from the lower limbs of trees and baited in the late afternoon, green leaves being placed in the bottom to provide shelter for the moths when they finish feeding.

The traps were used continuously [in Ontario] from the end of May to the end of October. Although few Noctuids were on the wing during June and captures in the traps were correspondingly small, records were numerous and continuous from late July throughout the summer, 64 species being taken. One trap, which captured 461 moths comprising 22 species in a single night, averaged 44 moths a night from June to October. Records of traps in the same locality were comparable as to species and individuals.

Manson (G. F.). **Aphid Galls as a Noctuid feeding Ground.**—*Canad. Ent.*, lxiii, no. 7, pp. 171–172. Orillia, Ont., July 1931.

Large numbers of Noctuid moths were observed at Lethbridge, Alberta, on nights in late August 1929, on the leaves and twigs of cottonwood trees (*Populus deltoides*), although they were absent or rare on baits of fermented honey or diluted molasses on the trunks. Galls of *Pemphigus populitransversus*, Riley, occurred on almost all the leaves, and observation showed that the moths were feeding at the

gall openings. Of the 16 species collected, *Euxoa ochrogaster*, Gn., was the most plentiful.

The fact that Noctuids are apparently readily attracted to trees containing Aphid galls may help to explain why gardens planted in adequate shelter belts are usually more heavily infested with cutworms than those in the open. *P. populitransversus* is very common on native cottonwoods.

Neiswander (C. R.). **The Sources of American Corn Insects.**—*Bull. Ohio Agric. Expt. Sta.*, no. 473, 98 pp., 3 figs., 183 refs. Wooster, Ohio, March 1931.

The insects attacking maize in America are grouped according to their relation to the plant. Notes are given on their habits, and an attempt is made to demonstrate the sources from which they arose. The relationship between insect and plant is constantly being modified, and this process may be expected to continue with further environmental adjustments. Of the 352 species recorded from maize, 196 are considered to do almost negligible damage. Two groups comprise 113 species that are primarily grass-maize succession insects and 34 that are grass-maize migrants; they include many that are very destructive to maize, and undoubtedly form the basis for the evolution of the chief maize-insect groups. The main path of their development was probably from the original grass feeders, through the grass-maize succession and grass-maize migrant groups, to the group designated normally as maize insects but not dependent upon that plant for subsistance or multiplication. Of 166 species regarded as important maize pests, 7 are undoubtedly non-grass forms, 4 are at present of doubtful origin and the remaining 154 are, or were at the outset, largely grass-feeders. It may therefore be concluded that maize pests are primarily and essentially grass insects in origin. The natural ecological factors tending to control destructive species are discussed. Ecological control may be induced to a certain extent by avoiding grass-maize rotations, or at least sufficient time should elapse after the grass is ploughed to ensure the death of all grass insects present before maize is planted. Against migrating species, barriers may be established between the two crops, or grass and maize fields may be separated sufficiently to prevent migration. For species that are dependent on maize, successive plantings of this crop should be avoided.

Of 37 species recorded as injuring stored maize, 12 are always associated with other species, their injury to maize being subsidiary, and 20 originally fed, and still feed, on small grains in storage, all of these having been imported from foreign countries. The remaining 5 species are native ones that have developed the habit of feeding on stored maize without first becoming adapted to other cereals.

An index to the species of insects concerned is appended.

Roach (W. A.) & Massee (A. M.). **Preliminary Experiments on the Physiology of the Resistance of certain Rootstocks to Attack by Woolly Aphis.**—*16th–18th Ann. Rep. East Malling Res. Sta. 1928–30*, pt. 2 (suppl.), pp. 111–120, 2 figs., 1 pl., 7 refs. East Malling, Kent, April 1931.

An account is given of experiments undertaken to determine the cause of the immunity of certain apple root-stocks from attack by the woolly aphis [*Eriosoma lanigerum*, Hausm.], since it was thought

that immune root-stocks might contain some substance inimical to the Aphids or lack one that is essential for their development. Injection of extracts of bark of immune varieties (Northern Spy) into susceptible ones (Kentish Codlin), or conversely, did not affect their immunity or susceptibility. Culturing the Aphids on solid media or, by feeding them through a membrane, on liquid media, both of which contained extracts of either immune or susceptible varieties, gave somewhat inconclusive results. The length of life of the adult insects was apparently unaffected by the different extracts, but in one experiment the young produced on the solid media containing extracts of Northern Spy were only slightly more than half as numerous as those produced on Allington Pippin media. The Aphids were kept alive on the media for 26 days.

Massee (A. M.). **The Resistance of certain Apple Stocks to Attacks of the Woolly Aphis.**—*16th–18th Ann. Rep. East Malling Res. Sta. 1928–30*, pt. 2 (suppl.), pp. 202–205, 1 ref. East Malling, Kent, April 1931.

The following is taken from the author's summary: A number of apple seedlings (Northern Spy × Doucin) that remained free from attack by *Eriosoma lanigerum*, Hausm., in preliminary trials [*R.A.E.*, A, xvi, 112] have now been tested for a further period of four years, and the immunity has been maintained. An apple root-stock (Ivory's Double Vigour), originally raised in New Zealand, has been tested for three seasons and has not been attacked.

Massee (A. M.). **Notes on Mites and Insect Pests for the Years 1928–30.** —*16th–18th Ann. Rep. East Malling Res. Sta. 1928–30*, pt. 2 (suppl.), pp. 189–201, 1 pl., 7 refs. East Malling, Kent, April 1931.

Notes are given on 24 injurious and beneficial insects and mites observed in Kent during 1928–30. Among the more important were *Tarsonemus fragariae*, Zimm., on strawberry [*cf. R.A.E.*, A, xix, 177] and *Dasyneura* sp. on black currant [xix, 612]. *Otiorrhynchus singularis*, L., which has apparently been increasing in numbers of recent years, has been reported from several localities as attacking one-year-old black currant and the scions of grafted apples. Observations during an outbreak on black currant in 1929 show that the weevils feed at night on the foliage, petioles and tender shoots, with the result that some of the bushes are completely defoliated. During the day they hide in the soil. The cultivation of the soil to destroy the hiding places of the weevils and the application of a spray of 6 lb. lead arsenate paste to 100 gals. water the following morning completely controlled the infestation. Damage to newly grafted apples may be prevented by painting the grafts with lead arsenate paste, or since the weevils are unable to fly, by adhesive bands. *Psylliodes attenuata*, Koch, caused considerable damage to hops in several localities. A 3 per cent. nicotine dust and sprays of lead arsenate or nicotine proved ineffective, but complete control was eventually obtained by jarring the beetles off the bines on to boards covered with adhesive. In recent years *Contarinia pyrivora*, Riley, has caused serious injury to pears in

some localities. Removing the fruits and treating the soil with insecticides proved of little value against it, but in 1928 and 1929 very satisfactory results were obtained by cultural measures. In one orchard in 1929 the soil was thoroughly cultivated once a week for six weeks, between 10th June, when most of the larvae had left the trees, and 5th July. In 1930 only a few fruits were infested, and these were all on trees adjoining an untreated orchard in which 80 per cent. of the fruits were attacked.

Unsuccessful attempts to establish *Aphelinus mali*, Hald., a parasite of the woolly apple aphis [*Eriosoma lanigerum*, Hausm.], in 1925, 1927 and 1928 are briefly discussed. In the last instance twigs bearing the parasitised host were tied to the trees in gauze fly-traps, which protect the parasites from predators but allow them to escape. During February 1929 a further attempt was made in a 3-acre apple orchard, 12 cages being used. In March many colonies of the host were present on the trees, and the parasites emerged some time before June. They continued to breed throughout the summer, and adults were observed up to the latter part of October. By November 1930 the parasites had spread throughout the orchard, and parasitised Aphids were also found in a neighbouring plantation.

Steer (W.). **The Loganberry Beetle.**—*16th–18th Ann. Rep. East Malling Res. Sta. 1928–30*, pt. 2 (suppl.), pp. 210–221, 1 pl., 12 refs. East Malling, Kent, April 1931.

This is a progress report on observations on *Byturus tomentosus*, F., a serious pest of loganberries and raspberries, conducted in Kent during 1927–30. The overwintered adults emerge from the soil in April and throughout May. They feed on various flowers, including those of hawthorn [*Crataegus*] and apple, sometimes causing some injury to the latter. The unopened flower buds of raspberries and loganberries may also be attacked, the beetles burrowing into the buds, or nipping them off at the base. This damage is usually more severe when there is no hawthorn blossom in the neighbourhood. Although, when the flowers are open, the beetles feed to a certain extent on the petals and sexual organs, the nectar in the cup of the flower appears to be the chief attraction to them. Oviposition occurs over a protracted period, and on raspberries begins early in June. The eggs are laid on the blossoms, those with set fruit being preferred, and hatch in about 10–12 days, when the fruits on which they have been deposited are rapidly swelling. At first the larvae feed on the surface of the fruit and then bore their way into it, usually at the base, until they reach the "plug," in which they tunnel, feeding on the surrounding drupels. When fully fed, the larvae burrow into the soil to a depth of from $\frac{1}{2}$ in. to 1 ft. and pupate about 5 weeks later. The pupal stage lasts about 4 or 5 weeks, but the beetles remain in the soil until the following spring. There is evidence that larvae that enter the soil very late may only pupate in August of the following year and pass a second winter in the soil as adults.

Various methods of control are reviewed from the literature. Tests with sprays on raspberries and loganberries show that infestation can be reduced by the application of lead arsenate to the developing fruit before the larvae hatch, but its use on loganberries cannot be recommended in view of the amount of poisonous residue remaining on the fruit at picking time. A proprietary derris spray was effective in 1928 and 1930, but failed to control an infestation in 1929. A new

proprietary pyrethrum wash, similar to that used by Tutin and Walton [*R.A.E.*, A, xvii, 536; xviii, 498], containing extract equivalent to 1 per cent. of dried flowers, and used at the rate of $\frac{1}{3}$–$\frac{1}{2}$ gal. to each bush, killed many adults, and the fact that equally good control was obtained with two applications (on 11th and 17th June) as with three (including one on 5th June) indicates that it had a markedly toxic effect on the young larvae. In order to remove the larvae from the fruit prior to canning, it should be stirred in a solution of 4 oz. salt in 1 gal. water, and then rinsed in clean water to remove the salt.

SPEYER (E. R.). **Entomological Report.**—*16th Ann. Rep. Exptl. Res. Sta. Nursery Mkt. Gdn. Ind. Devpmt. Soc.* ***1930***, pp. 68–72. Cheshunt, Herts., 1931.

Brief notes are given on experiments in the control of *Polia oleracea*, L., with various fluorides, as the danger of poisoning precludes the use of lead arsenate sprays on tomato plants in bearing. Sodium fluoride was found to be injurious to the foliage, and barium fluoride, which is not injurious, had no effect on the larvae. The cost of aluminium silicofluoride, which was toxic to the larvae and not injurious to the foliage, was too high. The most satisfactory results were obtained with synthetic cryolite, in the form of a very fine powder, used at the rate of 6 lb. to 100 gals. water, with the addition of 2 oz. saponin as a spreader. A few larvae, however, lived for several days after consuming a large amount of well-sprayed foliage, so that the action of cryolite may be largely that of a contact insecticide.

Serious injury has been caused to roses over a number of consecutive years by *Thrips fuscipennis*, Hal., the eggs of which are laid within the tissues of the outer flower petals about the time the buds begin to open. The chief injury is caused by the feeding of the adults at the tip of the young bud; the larvae apparently cause no injury when feeding between the petals of the unopened bud. The larva pupates on the inner side of the calyx sepal. The foliage is rarely injured, but, in the absence of buds, eggs may be laid within the opening leaves of weak shoots early in spring. *T. tabaci*, Lind., which is a common pest of cucumbers and carnation blossoms, is probably entirely parthenogenetic in glasshouses in England, but males of *T. fuscipennis* are present in large numbers except during the winter months. Thrips on roses and carnations can probably be controlled by the early removal and immediate burning of infested buds, which show deformed tips, or flowers, the petals of which become discoloured.

Observations on *Tetranychus telarius*, L., showed that one larval and two nymphal stages occur in both sexes. Eggs laid by unfertilised females always give rise to males.

W. H. Read states that among substances tested in an attempt to find a substitute for petroleum oil emulsion sprays against this mite, the most promising was a sulphonated derivative of crude petroleum used at a dilution of from 1 : 250 to 1 : 300. This product is a viscous liquid and yields a stable emulsion when stirred into water. Additional tests will be necessary to ascertain whether it causes oedema to tomato plants when applied at various stages of growth, as petroleum oil emulsions sometimes do, but no direct injury (scorching of foliage or flowers) results from its application at a concentration of 1 : 100, and dilution with hard water does not affect its stability. Experiments

have shown that oedema following the application of emulsified oil sprays is due to reduced rate of transpiration. Spraying with a 2 per cent. glue solution killed practically all the active mites, but failed to control the eggs and many of the resting stages. The results obtained from further fumigation experiments [*cf.* *R.A.E.*, A, xvii, 406; xviii, 599] with aliphatic alcohols, their formates and methyl esters of some of the fatty acids are briefly summarised. In general the substances having the greatest effect on *T. telarius* cause the severest injury to the plants.

MacDougall (R. S.). **Insects and other Invertebrates in 1930.**—*Trans. Highl. Agric. Soc. Scotland*, 1931, reprint 46 pp., 22 figs., num. refs. Edinburgh, 1931.

Among the insect pests dealt with are *Rhyacionia buoliana*, Schiff. (pine shoot tortrix), which attacks various pines, and has been recorded on Douglas fir [*Pseudotsuga taxifolia*] in Dorset. Notes are given on its bionomics; the only remedial measures that can be suggested are the pruning and destruction of the affected buds and shoots while the larvae are present and planting only in suitable soils. The habits of Cecidomyiids (gall midges) are discussed, and a tabulated summary is given of H. F. Barnes' work [*R.A.E.*, A, xviii, 501] on the three species that attack meadow foxtail grass [*Alopecurus pratensis*].

Whitehead (T.). **On the Transmission of Potato Leaf-roll by Aphides.**—*Ann. App. Biol.*, xviii, no. 3, pp. 299–304, 1 pl., 7 refs. Cambridge, August 1931.

Experiments in Wales with *Myzus persicae*, Sulz., and *M. circumflexus*, Buckt., carried on for two years with different varieties of potato, showed equal power of transmission of potato leaf-roll in both species [*cf.* *R.A.E.*, A, xviii, 520]. In some of the experiments, the incubation period of the disease was 24 days in plants exposed to *M. persicae* and 40 in those exposed to *M. circumflexus*. *Macrosiphum gei*, Koch, only transmitted the disease in one instance, and its importance as a vector in the field is still an open question. *Myzus circumflexus* has not been found on potatoes in the field, but has been recorded on oats and certain clovers.

Steel (A.). **On the Structure of the immature Stages of the Frit Fly (*Oscinella frit* L.).**—*Ann. App. Biol.*, xviii, no. 3, pp. 352–369, 11 figs., 6 refs. Cambridge, August 1931.

The morphology of the immature stages of *Oscinella frit*, L., is described in detail. In breeding experiments on oats, the eggs were found to be deposited generally inside the sheath at the base of the stem; from 1 to 15 were found inside each sheath, usually in groups. Incubation required from 3 to 7 days according to the temperature. The heaviest infestation occurred in plants with 2 or 3 leaves, plants older than the 4- or 5-leaf stage being seldom attacked. The hatching of the larva and the emergence of the adult are described.

KONTKANEN (P.). **Zur Biologie von** *Acanthocinus aedilis*, **L.**—*Ann. Soc. Zool.-Bot. Vanamo*, viii, no. 6, pp. 68–77, 1 fig., 26 refs. Helsingfors, 1929. (With a Summary in Finnish.) [Recd. August 1931.]

In Finland, where it has two generations a year, *Acanthocinus aedilis*, L., is only found in pines already weakened by *Myelophilus* (*Blastophagus*). It is parasitised by *Ephialtes tuberculatus*, Fourcr., which has not previously been recorded from it.

REICHERT (A.). **Rosenschädlinge.** [Rose Pests.]—*Die kranke Pflanze*, viii, nos. 6–7 & 8, pp. 96–99, 117–119, 2 pls. Dresden, 1931.

The Rutelid, *Phyllopertha horticola*, L., sometimes causes considerable damage to roses in Germany; the adults skeletonise the leaves and destroy the flowers, and the larvae feed on the roots. *Cetonia aurata*, L., is injurious in the adult stage only, destroying the tender leaves and flowers. The weevil, *Anthonomus rubi*, Hbst., oviposits in the flower-buds, in which the larvae feed. Infested buds should be collected and destroyed.

KRAUSS (J.). **Ein neues Bodendesinfektionsmittel.** [A new Soil Steriliser.]—*NachrBl. deuts. PflSchDienst*, xi, no 8, pp. 64–65. Berlin, August 1931.

It has been found that a solution prepared by completely dissolving 1 oz. naphthalene in 3 fl. oz. carbon bisulphide can be rendered miscible with water by stirring in 1 fl. oz. oil-soap spirit. After dilution with water, however, the naphthalene may crystallise out so that the orifices in the rose of a watering can are sometimes clogged by a greasy layer of it. In experiments this preparation proved an effective soil insecticide. Diluted at the rate of 1 : 100 and applied at the rate of 2 pints to 3 sq. feet it killed 95 per cent. of larvae of *Euxoa* (*Agrotis*) *segetum*, Schiff., placed at a depth of $1\frac{1}{4}$–$1\frac{1}{2}$ inches in moderately moist compost soil. Under identical conditions an emulsion lacking the naphthalene only killed 55 per cent. This second emulsion failed to kill larvae of *Otiorrhynchus sulcatus*, F., infesting potted cyclamens and primroses, but injured the plants, whereas the combined insecticide did no harm to the latter and destroyed nearly all the larvae. It also killed all millepedes and Collembola in grass-seed plots and Dipterous larvae and Collembola in mushroom beds without injuring the grass or mushrooms, and at 3 per cent. was completely successful against wireworms. No harm accrues to the plants from the naphthalene that remains in the soil.

SCHULZ (F. N.). **Zur Biologie des Mehlwurms** (*Tenebrio molitor*). **I. Mitt. Der Wasserhaushalt.** [On the Biology of *T. molitor*. I. The Conservation of Water.]—*Biochem. Z.*, ccxxvii, pp. 340–353, Berlin, 1930. (Abstract in *Zbl. Bakt.*, (2) lxxxiv, no. 8–14, p. 350. Jena, July 1931.)

Tenebrio molitor, L., is extremely resistant to desiccation, the almost mature larva being able to live for months in bran dried in a vacuum and subsequently reach the adult stage. Immature larvae also live in a state of suspended development for several months.

Farquet (P.). **Les criquets migrateurs en Valais.**—*Bull. Murith. Sion,* xlviii, pp. 57–77, 7 refs. St. Maurice, 1931.

In the Rhône Valley, the solitary phase (ph. *solitaria*) of *Locusta migratoria,* L., occurs regularly in the canton of Valais. In 1836–38 and 1857–58 the locusts appeared in swarms, but since then no outbreaks have been recorded. The author considers that the outbreaks followed years of exceptional spring floods of the Rhône, for after these, considerable areas in the valley remain covered with sand, and conditions favourable for egg laying are created. The river is now regulated so that floods hardly ever occur, and this may account for the cessation of the outbreaks.

Zpráva o škodlivých činitelích kulturních rostlin v Republice Ceskoslovenské v Roce 1929-1930. [Report on adverse Factors affecting cultivated Plants in the Republic of Czechoslovakia in the Year 1929–30.]—*Ochrana Rostlin,* xi, pt. 1–2, pp. 1–88, 8 figs. Prague, 1931.

This report includes papers by various authors on the diseases and pests of cultivated plants observed in Czechoslovakia in the year ending October 1930, arranged under the crops attacked and showing the locality of each infestation and the amount of the damage caused.

Blattný (C.). **Lze zjistiti přítomnost viru působícího některé choroby bramborů v jejich přenášeci, mšicích?** [Is it possible to detect the Presence of the Virus causing some Diseases of Potatoes in their Carriers, the Aphids?]—*Věstn. král. České Společn. Nauk,* ii, reprint 7 pp., 3 figs., 7 refs. Prague, 1931. (With a Summary in English.)

A short account is given of experiments carried out in 1924–26 in an attempt to detect the virus of common mosaic, leaf-roll and stipple streak of potato in *Myzus persicae,* Sulz., and other Aphids. Three groups of Aphids were examined: the first collected from diseased plants; the second reared on healthy plants, but consisting of descendants of generations that had been feeding on diseased potatoes; and the third reared on healthy plants from eggs laid on peaches. The method of preparing them for microscopic examination is described. The only difference found in the organs of the Aphids of the various groups was in the structure of the cell plasm in the salivary glands. This difference, characterised by the absence of a clear space round the nucleus, was observed in 26 Aphids out of 32 of the first group (irrespective of species or stage of development), in 5 out of 22 of the second, and in 2 out of 46 of the third.

Ghigi (A.). **Come si combatte la mosca delle ciliege.** [The Method of combating the Cherry Fly.]—*Giorn. Agric. Domenica,* no. 15, 13th April 1930, reprint 11 pp. Piacenza, 1930. [Recd. August 1931.]

Observations on *Rhagoletis cerasi,* L., and its control in North Italy were begun in 1915. All varieties of cherry are attacked, sour cherries or unripe ones not being less attractive, as has sometimes been stated. No parasite was obtained from thousands of pupae. No adults were taken in experiments with baits (vinegar, molasses, various essences, etc.), but on trees to which a bait spray of 5 lb. lead arsenate, 3 gals.

molasses and 100 gals. water was applied, 80 per cent. of the fruits were sound, as compared with 15 per cent. on unsprayed trees. Weekly applications are necessary, but the traces of arsenic left on the fruits are too slight to be dangerous. As regards the timing of the spray, it was found that in any season the adult flies begin to emerge when the fruits are about $\frac{1}{5}$–$\frac{1}{4}$ inch long, but do not oviposit for at least 20 days afterwards.

DEL GIUDICE (E.). **Contributo alla conoscenza del Tonchio della Sulla** (*Bruchidius pygmaeus* **Boh.**). [A Contribution to the Knowledge of the Soola Clover Bruchid, *B. pygmaeus*.]—*Boll. Lab. Zool. Portici*, xxv, pp. 249–256, 6 figs. Portici, 20th July 1931.

Of recent years soola clover (*Hedysarum coronarium*) in Sicily has been attacked by *Bruchus* (*Bruchidius*) *pygmaeus*, Boh. The adult, egg, and young larva are described. The adults emerge in May and June, or even July, from stored clover seeds, and the fertilised females oviposit in the field in the immature seeds. The larvae hatch in about a week, so that they are present before the seeds are harvested. They feed and hibernate in the seeds, pupating in spring. Stored seeds are seriously injured, and in some cases up to 50 per cent. of them are infested. In experiments, only 28 per cent. of the infested seeds germinated as compared with 80 per cent. of the sound ones, and the resultant plants were weakly. In the warehouse, *B. pygmaeus* is attacked by *Pediculoides ventricosus*, Newp., which sometimes destroys large numbers. The measures advised include screening the windows of the store with wire gauze of 1 mm. mesh to prevent the escape of the adults, and sowing only sound seed that has been kept for two years.

VAYSSIÈRE (P.). **Quelques observations sur les Acridiens migrateurs.**—*C.R. Acad. Sci. Fr.*, cxciii, no. 5, pp. 294–297, 2 refs. Paris, 1931.

The author states that the distribution of *Schistocerca gregaria*, Forsk., in West Africa is not limited in the south by 12° N. Lat. [*cf. R.A.E.*, A, xix, 599], and gives particulars of specimens from areas in French West Africa on and south of that parallel. Moreover, in the spring of 1930 swarms of immature *S. gregaria* were observed in the northern Belgian Congo, flying towards Uganda. Thus, the true southern limit is apparently constituted by the equatorial forest.

The outbreak of *Locusta migratoria migratorioides*, R. & F., which in the winter of 1930 caused considerable damage to *Eleusine*, *Sorghum*, and maize in Ubangi-Shari, assumed disastrous proportions in Kamerun, the Ivory Coast and French Guinea in 1931; in French Guinea two-thirds of the banana crop was destroyed. The multiplication of this locust appears to be favoured by bush fires, which produce ideal conditions for oviposition. In many localities in French West Africa mixed swarms of *Schistocerca* and *Locusta* have been recorded.

PAILLOT (A.). **Parasitisme et symbiose chez les Aphides.**—*C.R. Acad. Sci. Fr.*, cxciii, no. 5, pp. 300–301. Paris, 1931.

Normal bacterial infection in Aphids does not appear to lead to a serious pathological condition causing the death of the host. The parasitic bacteria of these insects are characterised by their extreme fragility. They usually stain badly, will not grow in the ordinary

media used in bacteriology and cannot infect other invertebrates. Hereditary transmission of bacteria is the rule in Aphids, although it occurs only exceptionally with most insects.

Allan (W.). **Insect Pests and Plant Diseases of economic Importance during the Year.**—*Ann. Rep. Dept. Agric. N. Rhodesia 1930*, pp. 21–24. Livingstone, 1931.

A sudden outbreak of *Laphygma exempta*, Wlk. (army worm) which occurred in Northern Rhodesia early in January 1930, was almost completely controlled by trenching, ploughing and beating, and practically no damage was caused. Investigations carried out during October and November demonstrated the presence of a swarm of *Nomadacris septemfasciata*, Serv. (red locust) in one district.

Pests of *Citrus* included *Aphis tavaresi*, Del G., which appeared to be abnormally prevalent, *Icerya purchasi*, Mask., and *Coccus hesperidum*, L., which was particularly injurious in some cases, though where it is abundant it is usually attacked by natural enemies, which include Hymenopterous parasites, the Coccinellids, *Cydonia* (*Chilomenes*) *lunata*, F., and *Exochomus auritus*, Scriba, and the larvae of the Noctuid, *Eublemma* sp. Considerable damage to the fruit was caused by fruit-piercing moths and the larvae of *Argyroploce leucotreta*, Meyr. The Pentatomid, *Agonoscelis puberula*, Stål, occurred in great numbers on the trees, particularly in September, but no serious injury appeared to result. Though *A. versicolor*, F., is present in the Territory, it has only been observed on a native tree, *Dichrostachys glomerata*.

Considerable injury to coffee was caused by *Anthores leuconotus*, Pasc. (white borer) and a Coccid, apparently *Coccus viridis*, Green, and the young bushes were damaged by the grasshoppers, *Phymateus viridipes*, Stål, *Tapesia intermedia*, Sjöst., and *Ornithacris cyanea magnifica*, Bol. Pests of cotton have been noticed elsewhere [*R.A.E.*, A, xix, 293]. Figs were attacked by the Lamiid, *Phryneta spinator*, F., and the weevil, *Omophorus stomachosus*, Boh. It seems probable that most of the trees that fail to produce edible fruit are of the Smyrna type, which requires fertilisation by *Blastophaga psenes*, L. (*grossorum*, Grav.). Fruit-piercing moths were unusually abundant, especially on mangos and peaches, and leaf and fruit eating beetles were also troublesome, particularly the Cetoniid, *Pachnoda impressa*, Goldf., and the Melolonthids, *Spathoschiza debilis*, Arr., *Schizonycha profuga*, Pér., and *Trochalus* sp.

Early in the year young maize was severely damaged by *Busseola fusca*, Fuller (stalk borer) in three districts, though farms on which refuse had been regularly destroyed were not attacked. The Tettigoniid on maize tentatively identified as *Acanthoplus discoidalis*, Wlk. [xix, 192] has now been determined as *A. speiseri*, Brancs. In addition to the pests of vegetables mentioned in the previous report [*loc. cit.*], all of which again proved serious, *Epilachna dregei*, Muls., caused severe damage to spinach, potatoes and tomatos. The ordinary arsenical sprays gave effective control, but little success was obtained in an experiment with pyrethrum dust.

Smit (B.). **Insect Damage to Hides and Skins.**—*Fmg. S. Afr.*, 1931, reprint no. 27, 3 pp., 2 figs. Pretoria, May 1931.

Considerable damage is caused annually to hides and skins by insects in South Africa, the loss on sheep skins alone being estimated at

£350,000. The insects begin to feed where pieces of flesh and fat are left on a badly flayed skin and at the edges where it is folded and creased, and eventually bore through it. They also attack badly salted skins, and those that are sun-dried are quickly destroyed.

Most of the damage is done by *Dermestes vulpinus*, F., which occurs on cattle hides and sheep and goat skins as soon as they are dried. In the summer reproduction is very rapid, and a large stack of sheep skins may be destroyed in a few weeks. Constant sorting and restacking becomes necessary in the warehouse, where the beetles are shaken out of infested material and crushed. In some warehouses fowls are kept to destroy the larvae.

Tineola bisselliella, Humm., is a less serious pest and chiefly attacks the wool of Merino sheep skins.

LE PELLEY (R. H.). **The Control of the Capsid Bug on Coffee.**—*E. Afr. Standard*, reprint 1 p. Nairobi, 30th April 1931.

Injury to coffee in Kenya by *Lygus simonyi*, Reut. [*R.A.E.*, A, xviii, 440] has recently been serious. Successful results in control have been obtained with a spray prepared by steeping 1 lb. pyrethrum powder in 1 gal. paraffin for at least 24 hours, the mixture being well shaken or stirred at intervals. The clearer liquid at the top is then decanted and filtered through closely woven cloth. Applications may be made with a small hand sprayer. On average-sized bushes of full bearing age, this entails the use of only 2–2½ gals. spray per acre. In applying any form of paraffin to coffee it is important to make sure that scorching will not occur under local conditions. Scorching was negligible in the experiments with paraffin-pyrethrum, but was severe with certain proprietary sprays tested. The number of bugs on a tree, which sometimes reaches 300, should be reduced to 2 or 3 by one application. It will probably be best to spray about 6 weeks before blossoming, and a second application after a fortnight may be necessary.

LE PELLEY (R. H.). *Antestia* **Bug on Coffee. Experiments with new Control Method.**—*E. Afr. Standard*, reprint 3 pp. Nairobi, 11th June 1931.

Successful experiments against *Antestia*, which causes serious injury to coffee in several localities in Kenya, have been carried out with the pyrethrum-paraffin spray noticed in the preceding paper. The pyrethrum powder used was produced from plants grown locally, and the spray obtained from it was found to be superior to that made from powders from other sources. In order to prevent part of the spray being wasted, a sheet was placed over the tree so as to hang lower on the leeward than the windward side, from which the spraying was done. The cover serves to retain the light volatile mist for a short time and can be removed a few minutes after spraying. Since a high percentage of bugs recover from the treatment, the best results are obtained by shaking the bushes and spraying the ground around them, about half an hour after the first application. In one experiment in which the spray was applied in this way at the rate of 2 gals. per acre to the trees and 1 gal. per acre to the ground, 100 per cent. control was obtained.

de Jong (J. K.). **De invloed van het klimaat op** *Helopeltis*. **I. De invloed van de relatieve vochtigheid op de** *Helopeltis* **in theedistricten van Sumatra's Oostkust.** [The Influence of Climate on *Helopeltis*. I. The Influence of relative Humidity on *Helopeltis* in the Tea Districts of the East Coast of Sumatra.]—*Arch. Theecult. Ned.-Ind.* 1931, no. 3, pp. 135–142, 2 graphs, 8 refs. Buitenzorg, June 1931. (With a Summary in English.)

Though 15 years have passed since *Helopeltis* was discovered on tea on the East Coast of Sumatra, it has never developed into a pest there and is unlikely to do so, the particular climatic conditions of the tea districts of Siantar being unfavourable to it. It may appear where shade-trees are planted, but is absent in shadeless tea plantations. A study showed that differences in light and temperature are not enough to account for its absence, but that a fairly strong mountain wind produces a low degree of moisture that prohibits its development except in shade.

Corbett (G. H.). **Entomological Notes. Second Quarter, 1931.**—*Malayan Agric. J.*, xix, no. 7, pp. 351–355, 2 pls. Kuala Lumpur, July 1931.

An investigation to ascertain whether copra was heavily infested in Malaya with insects before leaving coconut estates and to devise methods for reducing such infestations showed the following species to be the most important ones present: the Nitidulid, *Carpophilus* sp., probably *dimidiatus*, F.; the Clerid, *Necrobia rufipes*, DeG.; the Cucujids, *Silvanus surinamensis*, L., and *Cathartus* (*S.*) *advena*, Waltl; the Tenebrionid, *Tribolium castaneum*, Hbst.; and the Pyralid, *Ephestia cautella*, Wlk. The fact that the last four insects are commonly associated with stored rice indicates that the use of old rice-sacks for the purpose of transporting copra is conducive to its becoming infested. These sacks could be rendered free from insects by immersion in boiling water or in a solution of derris. Variations in the numbers of *Carpophilus* were found to be in proportion to the amount of improperly dried copra, and infestations can usually be controlled either by acceleration of the drying process to prevent the formation of moulds, which appear to attract the beetles, or by making sure that copra is sufficiently dried on leaving the kiln. The presence of *N. rufipes*, which was found to occur in some stores and not in others, apparently coincided with the return of empty sacks from the ports, copra shipped direct from the estates being free from infestation.

Complete defoliation of *Albizzia* used as a shade tree for crops was caused by the Psychid, *Clania variegata*, Sn., over some 30 acres. The use for shade of trees closely related to the crop or liable to be severely defoliated by any pest should be avoided. Distribution of this bagworm is effected in the larval stage, the caterpillars suspending themselves by silken threads from the trees and being carried by the wind, or, where they reach the ground, crawling to adjacent trees. Adhesive bands were placed on the trunks to prevent them from ascending the trees.

Injury to stored derris roots by beetles was twice reported. Derris is not only seriously affected in Malaya but consignments exported have been found to be severely damaged by insects on arrival at their destina-

tion. The principal beetles feeding on derris root are the Bostrychids, *Sinoxylon anale*, Lesne, *S. malaccanum*, Lesne, *Xylopsocus capucinus*, F., and *Dinoderus bifoveolatus*, Woll., the Lyctid, *Minthea rugicollis*, Wlk., the Scolytid, *Hypothenemus eruditus*, Westw., and the Colydiid, *Bothrideres* (?) *andrewesi*, Grouv. Where derris is grown on a commercial scale and is stored for an indefinite time, fumigation and storage in air-tight receptacles should be undertaken. Black discolouration of coffee seeds in apparently healthy berries was reported from one estate. Its occurrence in both ripe and very young berries indicates that the damage is inflicted when the plants are flowering. The examination of flowers revealed the presence of a thrips, (?) *Heliothrips haemorrhoidalis*, Bch., which probably introduces a pathogenic organism. *Gracilaria theivora*, Wlsm., was reported as causing serious damage to the younger leaves of tea at high altitudes. The larva at first mines the young leaf from the mid-rib to the edge, and later folds the leaf and feeds under the fold. Control measures consist of cropping attacked leaves and all shoots ready for plucking, and burying or burning prunings.

MILLER (N. C. E.). **The Bionomics of some Malayan Rhynchota (Hemiptera-Heteroptera).**—*Sci. Ser. Dept. Agric. S.S. & F.M.S.*, no. 5, 142 pp., 123 figs., 72 refs. Kuala Lumpur, 1931.

Some eighteen species of Heteroptera from Malaya are dealt with, notes being given on their distribution and bionomics, with descriptions of the stages. Many of them are polyphagous ; among those that are apparently restricted in their food-plants are *Tetroda histeroides*, F., *Antestia degenera*, Wlk., and *Cletus punctiger*, Dall., which feed of Gramineae, *Brachyplatys subaeneus*, Westw., on Leguminosae, and *Acanthocoris scabrator*, F., on Solanaceae and Convolvulaceae. *Anoplocnemis phasiana*, F., and *Riptortus linearis*, F., have a somewhat wider range, and *Nezara viridula*, L., has been recorded as attacking 35 species of plants belonging to 17 different families.

Derepteryx chinai, sp. n., is described from wild raspberries, and is considered a potential pest of cultivated raspberries, which have not as yet been successfully grown where it occurs. Its range apparently does not extend to altitudes below about 2,500 ft. *Ochrochira rubrotincta*, sp. n., which appears to be confined to elevations above 3,000 ft., was first taken on *Citrus*, of which it seriously damaged the young shoots, and subsequently on *Hibiscus* sp. and *Cosmos bipinnatus* ; it has also been found on tea but was not observed to feed on it.

NEWMAN (L. J.) & O'CONNOR (B. A.). **Fruit Fly** (*Ceratitis capitata*). **A further Series of trapping or luring Experiments.**—*J. Dept. Agric. W. Aust.*, (2) viii, no. 2, pp. 316–318. Perth, W.A., June 1931.

A year's experiments were carried out to test the relative values of pollard and borax and a liquid soap known as Clensel [sometimes used as a contact spray against other insects] as a bait for *Ceratitis capitata*, Wied., in Western Australia [*R.A.E.*, A, xix, 141]. Ten tins and ten glass jars, of a capacity of ½ pint, were half filled and a glass and tin of each bait placed in each of five trees. The pollard and borax caught 4,056 flies (of which 73·7 per cent. were females) and the Clensel,

at strengths of from 1 : 20 to 1 : 80, 16,397 (70·2 per cent. females). Though the tins yielded 11,922 flies and the glass jars 8,531, the latter gave as good results as the tins during the important trapping season (July–December), and their use is recommended, as tins rust and are less easily cleaned. The best concentration for the Clensel appears to be 1 : 30.

JARVIS (E.). **Ants in Canefields and Buildings.**—*Queensland Agric. J.*, xxxv, pt. 6, pp. 360–362. Brisbane, June 1931.

A brief summary is given of control measures against ants, including means of destroying them in their nests and the use of various baits and barriers.

RISBEC (J.). **Un pentatome parasite de la chenille épineuse du cotonnier** (*Earias huegeli*).—*C.R. Acad. Sci. Fr.*, cxciii, no. 4, pp. 247–250. Paris, 1931.

Descriptions are given of all stages of a Pentatomid found on cotton in New Caledonia, and which appears to be of value in reducing the numbers of *Earias huegeli*, Rogenh., the most serious pest of cotton there. One bug destroys at least 50 larvae of the moth, usually attacking them just as they are weaving their cocoons for pupation. The eggs are laid in batches of about 20, attached to the points of the bracts of the cotton plant. The larval moults occur 3, 4, 8 and 18–20 days respectively after hatching.

ILLINGWORTH (J. F.). **Yellow Spot of Pineapples in Hawaii.**—*Phytopathology*, xxi, no 9, pp. 865–880, 10 figs., 7 refs. Lancaster, Pa., September 1931.

Yellow spot disease of pineapple was first recognised in Hawaii in 1926 and has since become widespread there. An account is given of its symptoms and spread, which is favoured by humid conditions and retarded by drought. The manner in which the initial spots appear suggests that insect infection takes place near the centre of the plant. Experiments designed to determine the vector are described. After a number of insects associated with pineapple had been proved negative in this respect, evidence was obtained indicating that *Thrips tabaci*, Lind., is a vector, and this was subsequently confirmed [*R.A.E.*, A, xix, 316]. The attack is made down in the axils of the leaves, so that theoretically the thrips could be kept out of the plant by a mechanical plug. Various substances have been tried, including tobacco dust, wheat bran, rice husks and sand. A deterrent added to these, composed of oil emulsion with tobacco extract, increases their efficiency. Dusting sulphur is also a promising remedy ; tobacco extract alone evidently volatilises too quickly, as it has proved ineffective. Heavy rain and drought limit the numbers of the thrips, and the predacious Anthocorid, *Orius* (*Triphleps*) *persequens*, B. White, is present in the flowers or wherever the thrips congregate. As soon as this bug becomes abundant in spring, the thrips decrease in numbers. The Cucujid, *Cryptamorpha desjardinsi*, Guér., is another predator, both adults and larvae living deep down in the leaves.

TEMPANY (H. A.). **Entomological Division.**—*Ann. Rep. Dept. Agric. S.S. & F.M.S. 1930*, pp. 26–27. Kuala Lumpur, 1931.

A brief review is given of work on insect pests in Malaya during 1930, much of which has already been noticed [*R.A.E.*, A, xviii, 509; xix, 295, 508]. The egg-parasite, *Trichogramma nanum*, Zehnt., which is being reared on eggs of *Sitotroga cerealella*, Ol., for use against the rice stem-borers, *Diatraea auricilia*, Dudg., and *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.), has been distributed in enormous numbers, and at the end of December the average percentage of parasitism of the former was 27·60 in the colonised area as against 2·73 in the uncolonised, and of the latter, 22·91 as against 1·61. The presence of the *transiens* phase of the locust, *Locusta migratoria* [*migratorioides*, Rch. & Frm.], was reported in one area; its disappearance after a few weeks is ascribed to the breaking-up of incipient swarms by poison bait and fires. Dipterous parasites were obtained from the adults.

CLAUSEN (C. P.). **Two Citrus Leaf Miners of the Far East.**—*Tech. Bull. U.S. Dept. Agric.*, no. 252, 13 pp., 6 figs., 18 refs. Washington, D.C., July 1931.

A general account is given of the Tineid, *Phyllocnistis citrella*, Staint., occurring in Japan, China, India and other countries, and the Halticid, *Throscoryssa citri*, Mlk., in Assam, both being leaf-miners of *Citrus* and as yet unknown in the United States. The former has been previously recorded as *P. saligna*, Zell. [*R.A.E.*, A, viii, 194; xvi, 145]. It has a number of other food-plants, which are recorded from the literature. About six generations occur in a year in southern Japan, one generation being produced in six weeks and most of the injury being caused by the first two in the spring. The egg, larval and pupal periods were observed to last 9, 20 and 9 days respectively. The winter is passed in the adult stage. The egg is deposited on the lower leaf surface near the midrib, and the young larva immediately enters the leaf and begins to construct a mine; this it does not leave until it is full fed when it splits the mine, usually at the margin of the leaf, and draws the leaf-edge over itself as a shelter for pupation. The adults are nocturnal in habit; under laboratory conditions they mate shortly after emergence and begin oviposition within 6 days. The larvae and pupae are parasitised by Chalcidoids, sometimes to the extent of 60 per cent.

Throscoryssa citri hibernates as an adult in sheltered places, has only one generation in a year and is not known to feed on any plant other than *Citrus*. Emergence from hibernation occurs about the middle of March, and the beetles feed on newly developing foliage of *Citrus*, eating out irregular portions of the leaf margins. Oviposition begins about a week later, the eggs being deposited on the lower surface of the new leaves, some of which show as many as 39. Oviposition continues for about 3 weeks, the incubation period requiring 8 or 9 days. The larvae mine the leaves, frequently leaving one leaf for another, and the entire leaf tissue between the epidermal layers is eaten away. They feed for 10–12 days and then drop to the ground and enter the soil to a depth of about 1 inch, pupating 7 days later. The pupal stage lasts 10–12 days. *T. citri* is parasitised by a Braconid that oviposits through the leaf epidermis into the larva beneath, and a Chalcidoid that was obtained from the early stage larvae within the mines.

Norris (D.). **Entomological Section.**—*Rep. Comm. Dir. Indian Lac Res. Inst. Namkum, Ranchi, 1930–31,* pp. 33–53, 1 pl. Calcutta, 1931.

An account is given of the insects attacking lac (*Laccifer lacca,* Kerr) and their natural enemies [*cf. R.A.E.,* A, xix, 25], with the dates of their emergence in relation to the various crops. The occurrence of six generations a year of the Noctuid, *Eublemma amabilis,* Moore [xviii, 638] has been verified. The Tineid, *Holcocera pulverea,* Meyr., the life-history of which is under investigation, has five generations a year. *E. scitula,* Ramb., is predacious on lac, but at Namkum has only been found attacking *Lecanium* sp. on *Cajanus indicus.* The larvae of *Chrysopa* sp. attack the lac insects during August, September and October. The eggs are laid singly on the lac encrustation or the upper surface of leaves and twigs of lac infected trees, and pupation occurs on the surface of the encrustation. An Ichneumonid parasitised the pupae. It has been found possible to rear the Braconid, *Microbracon* (*Bracon*) *tachardiae,* Cam., the chief parasite of *E. amabilis,* in captivity, and oviposition was obtained on the ants, *Camponotus compressus,* F., and *Cataglyphis bicolor,* F., attempts with Lepidopterous larvae other than *Eublemma* being unsuccessful. Emergence occurs throughout the year. *Brasema annulicaudis,* Cam., was reared on larvae of *M. tachardiae*; it only oviposited on those that had formed cocoons but had not pupated. The Eulophid, *Tetrastichus purpureus,* Cam., a parasite of lac, emerges during every month and probably has at least six generations a year, of which three occur shortly after the crop is cut and could be prevented by treatment of the fresh cut crops. The Encyrtid, *Tachardiaephagus tachardiae,* How., is also very abundant, emerging throughout the year.

Of the undetermined insects mentioned in the previous paper [xix, 26], the Ichneumonid and Chalcid parasites of *H. pulverea* are now recorded as *Pristomerus marginicollis,* Cam., and *Eurytoma* (?) *pallidiscapus,* Cam., which latter is also an occasional parasite of *Microbracon tachardiae* and *Apanteles tachardiae,* Cam.; the spotted Encyrtid parasite of *L. lacca* as (?) *Perissopterus* sp., and the black Encyrtid as *Copidosoma* (?) *clavicornis,* Cam.

As regards the control of the insect enemies of lac [xviii, 638; xix, 600], water immersion of the crop is now not recommended, as though it causes almost complete mortality of the insects, it involves considerable trouble and affects the lac in various ways. Brief notes are given on pests of the trees on which the lac is cultivated. One of the most important during the year under review was a termite, against which the most successful measure was fumigation of the nests. It has also been controlled by placing tins of surface sand full of ants from a nest of *Solenopsis geminata rufa,* Jerd., round infested trees or plants, as the ants then attack and destroy the termites.

Investigations on the Spike-Disease of Sandal.—16 pp. Bangalore, Indian Inst. Sci., 1931.

In view of the importance of spike-disease of sandal (*Santalum album*) in southern India, a study, which is recorded by N. C. Chatterjee (pp. 12–14), has been made of the insect fauna of the tree, from which it is hoped to determine whether Arthropods play any part in the dissemination of the disease. Biological studies have restricted the species considered as possible vectors to 19 Rhynchota, 3 Thysanoptera,

3 weevils and a mite. The life-histories of many of these are under observation. Continuous feeding for two months by large numbers of a Jassid, *Petalocephala* sp., and an Issid, *Sarima* sp., and for five months by *Saissetia* (*Lecanium*) *nigra*, Nietn., may cause die-back of the branches and the condition known as stag-headedness; the possibilities of dissemination of spike-disease by these species are not entirely excluded. The Curculionid, *Sympiezomias cretaceus*, Faust, having been fed on spike-infected leaves, has produced in healthy leaves distinct symptoms of a disease that may prove to be the forerunner of spike-disease.

The analysis and interpretation of data provided by a roughly quantitive survey of the insect fauna of the sandal tree is discussed by C. Dover (pp. 14–16). Of the Rhynchota, the Tropiduchid, *Tambinia verticalis*, Dist., and the Jassid, *Moonia variabilis*, Dist., are considered to require further study with regard to the spread of the disease, as well as the first two named above, and attention should also be given to the Psyllids, Aphids, Thysanoptera and mites found on the tree.

KUNHI KANNAN (K.). **Ground Grubs and their Movements in the Soil.**—*J. Mysore Agric. Exp. Un.*, xii, no. 1, pp. 3–4. Bangalore, 1931.

Larvae of *Oryctes rhinoceros*, L. (palm beetle) were found in Mysore to occur in the dried and broken up dung along the outer edges of manure heaps, and this is thought to be due to greater aeration there as compared with the more compact interior of the heaps. It is also thought possible that Lamellicorn larvae congregate round the roots of sugar-cane for the same reason, and only cut the roots because they are in their way; this is supported by the fact that several individuals have been reared from egg to adult in soil rich in manure but lacking green vegetable matter. In an experiment, larvae in a jar of loose dry soil remained near the bottom, but others in a jar with a moist layer on the top came to the surface, presumably for air. This suggests that in a field of sugar-cane, etc., they come up to the roots of the plants if the soil becomes packed. Uniform manuring and thorough cultivation of the field when the grubs become injurious might divert them from the roots to their more natural food, namely soil rich in organic matter.

JANISCH (E.). **Experimentelle Untersuchungen über die Wirkung der Umweltfaktoren auf Insekten. II. Ueber die Mortalität und die Variationsbreite tropischer Insekten in Ceylon mit allgemeinen Bemerkungen über die Umweltabhängigkeit und das biologische Optimum.** [Experimental Studies on the Influence of environmental Factors on Insects. II. On the Mortality of Insects in Ceylon, and the extent of its Variation, with general Notes on the environmental Influences and the biological Optimum.]—*Z. Morph. Oekol. Tiere*, xx, no. 2–3, pp. 287–348, 11 figs., 33 refs. Berlin, 15th July 1931.

Breeding experiments in Ceylon with *Attacus ricini*, Boisd., *Tiracola* (*Arcilasisa*) *plagiata*, Wlk., *Bagrada picta*, L., *Cimex hemiptera*, F. (*rotundatus*, Sign.), and *Siphunculina funicola*, de Meij., showed that the percentage of mortality in the immature stages was always very low if the temperature and humidity conditions were such as to cause

the quickest possible succession of generations. Therefore, the optimum conditions for development are also those at which the greatest percentage of the progeny survives. The problem of optimum conditions is discussed at great length, and the hyperbolic curve is considered unsuitable for calculating the number of generations a year under known conditions.

West (C. J.). Ed. **Annual Survey of American Chemistry for 1930. Vol. V.**—629 pp. New York, Chemical Catalog Co. Inc., 1931.

In Chapter 26, entitled " Insecticides and Fungicides " (pp. 398–421, 227 refs.), R. C. Roark reviews the progress of recent work from the literature published in 1930, sections dealing briefly with each material and methods of evaluating insecticides in general. The problems on which further research are particularly desirable are briefly outlined.

Friend (R. B.). **The European Pine Shoot Moth. A potential Enemy of Pines in Connecticut.**—*Circ. Connecticut Agric. Expt. Sta.*, no. 80, pp. 63–68, 5 figs. New Haven, Conn., August 1931.

Rhyacionia buoliana, Schiff. (European pine shoot moth) [*R.A.E.*, A, xvii, 14 ; xix, 221] has recently become a serious pest of imported European pines and of several indigenous species in many parts of Connecticut. Injury to white pine [*Pinus strobus*] is relatively rare and has not yet assumed any importance. Infestations have been most severe on red pine [*P. resinosa*], the planting of which is increasing in the State, and as in plantations the intensity of attack increases each year and young trees appear to be particularly susceptible to injury, the inauguration of control measures on the initial discovery of infestation is essential. The presence of the larvae is indicated by pitch on the buds, dead needles at the tip of the branch and dead, deformed buds. The most practicable method of control, which can be continued annually till the trees are 7 or 8 feet high, is to cut off and burn infested shoots from the middle of August to the following 1st June, preferably in the spring before the larvae became active and cause the maximum amount of injury. Certain sprays seem promising, one of the most satisfactory consisting of nicotine sulphate (1 : 400) and penetrol [xvii, 715] to make one per cent. by volume [*cf.* xix, 349]. The trees should be thoroughly sprayed three times at weekly intervals beginning about 21st June.

Gould (G. E.). **Further Studies of Truck Crop Aphids.**—*Bull. Virginia Truck Expt. Sta.*, no. 71, pp. 811–835, 7 charts, 1 fig., 51 refs. Norfolk, Va., 1st April 1930. [Recd. September 1931.]

This bulletin constitutes a preliminary report of the food-plants and overwintering habits of *Myzus persicae*, Sulz. (spinach aphis), *Macrosiphum gei*, Koch (*Illinoia solanifolii*, Ashm.) (potato aphis), *M.* (*I.*) *pisi*, Kalt. (pea aphis), *Brevicoryne brassicae*, L. (cabbage aphis), *Aphis* (*Rhopalosiphum*) *pseudobrassicae*, Davis (turnip aphis), *A. gossypii*, Glov. (melon aphis) and *A. rumicis*, L. (bean aphis), which attack vegetable crops in Virginia. The seasonal history of these Aphids is discussed, and descriptions are given of the winged and wingless viviparous females, in some cases from the literature. Brief notes are also given on other Aphids of minor importance ; these include an unidentified species of *Macrosiphum* found in the autumn

on lettuce, the wingless oviparous females, wingless and winged viviparous females and winged males of which are described. Control measures are discussed. In the Norfolk area most of these Aphids overwinter as viviparous females on the vegetables that they attack in summer or on allied plants, although sexual forms are not unknown. The production of young continues slowly throughout the winter months.

MACKIE (D. B.). **A Report of the Coccids infesting Avocados in California, with special Reference to** *Chrysomphalus dictyospermi* **(Morgan).**—*Mon. Bull. Dept. Agric. California*, xx, no. 7, pp. 419–441, 4 figs. Sacramento, Cal., July 1931.

The following is taken from the author's summary and conclusions :—An examination of over 27,000 trees involving practically all the bearing avocado properties of California shows that 43 per cent. are infested with various Coccids, of which *Aspidiotus lataniae*, Sign., a species hitherto practically unknown in the State, is predominant. *Chrysomphalus dictyospermi*, Morg., is next in importance, but occurs only in Los Angeles and Orange Counties. A list is given of upwards of 150 species of economic and ornamental plants attacked by these two Coccids in various parts of the world. A campaign has been in progress for the eradication of *C. dictyospermi* in nurseries in California since 1924, when it was discovered infesting avocado imported from Florida, and the great majority of those formerly infested are clean. In 1928, *A. lataniae* was recorded from seven food-plants in Los Angeles, and has been taken in quarantine since 1913. In spite of its cosmopolitan distribution and wide range of food-plants, it has only been recorded as a pest in glasshouses. It occurs on avocado in Florida and Guatemala.

These investigations indicate that Coccids do not constitute a menace to avocados in California.

McLEAN (R. R.). **Insect Pests and Plant Diseases of the Avocado in California.**—*Mon. Bull. Dept. Agric. California*, xx, no. 7, pp. 442–446, 1 fig. Sacramento, Cal., July 1931.

Of the Thysanoptera infesting avocado in California, *Heliothrips haemorrhoidalis*, Bch., is by far the most injurious, chiefly attacking thin-skinned varieties. Injury is caused by chafing and rubbing the leaf and fruit surfaces and produces a characteristic silvery appearance of the leaves as well as browning and sometimes cracking of the fruit. Damage is usually greatest on the inside of the older trees, where the foliage is dense. Control measures that include the use of nicotine either as a dust or as a spray with a spreader have given the most satisfactory results, but as the eggs are not killed, 2 or 3 applications should be made at intervals of 8–12 days in summer, and 14–30 days in winter. *Paratetranychus* sp. has been causing serious injury for the past three years in several localities. Cheap and effective control has been obtained with a fine sulphur dust. Coccids, which occasionally injure the leaves, twigs and fruit [see preceding paper], can be controlled by fumigation or oil sprays, but the effect of these materials on the trees and the time at which they should be applied require further study. Various leaf-eating insects, among which is *Amorbia essigana*, Busck, occasionally attack avocado, but may be controlled by dusting or spraying with lead arsenate.

Woodhams (G. E.). **Release of Citrophilus Mealybug Parasite in Nurseries.**—*Mon. Bull. Dept. Agric. California*, xx, no. 7, pp. 455–457, 3 figs. Sacramento, Cal., July 1931.

Since *Coccophagus gurneyi*, Comp., has apparently been effective in checking infestations of the citrophilus mealybug [*Pseudococcus gahani*, Green] on *Citrus* in southern California, it was decided to liberate it on various infested plants in nurseries in the northern part of the State. A total of 45,000 parasites was sent in two consignments, on 20th May and 1st June. In order to prevent exposure to extremes of temperature and humidity, cool air was allowed to blow over the containers during transit and liberations were made as rapidly as possible. In spite of rapid and careful transport, however, one-third of the parasites in the first consignment and two-thirds in the second perished. Since *C. gurneyi* will only attack *P. gahani*, the parasites were released on heavily infested plants under muslin cages. The high mortality among them during transport shows that insectaries should be established in localities where liberations are desired.

Campbell (R. E.) & Elmore (J. C.). **Damage to Tomatoes in Southern California by the Tomato Pin Worm and the Potato Tuber Moth.**—*Mon. Bull. Dept. Agric. California*, xx, no. 7, pp. 458–460, 7 refs. Sacramento, Cal., July 1931.

As numerous reports were received in 1930 of injury to tomatos in south-western California by *Phthorimaea* (*Gnorimoschema*) *lycopersicella*, Busck [*R.A.E.*, A, xvi, 633], it was considered advisable to make a thorough survey of the situation. This moth has previously been recorded from California and Mexico as *P.* (*G.*) *glochinella*, Zell. (egg-plant leaf-miner) [*R.A.E.*, A, xiii, 628; xvi, 194; xvii, 560]. An account is given of its bionomics, which differs in some respects from one already noticed [xvi, 634]. The eggs are laid singly or in batches of 3 to 6 on the leaves and fruit, into which the larvae bore soon after hatching. They only remain in the tissues of the leaves for a short time, however, and then emerge and roll them into shelters within which they feed. In the case of the fruit, the larvae usually enter at the calyx or stem, but during heavy infestations, the fruit may be injured in other places. The stems of the plants are also occasionally infested. Pupation occurs in the soil. Breeding may continue throughout the winter in southern California, where tomatos survive in protected areas. Larvae similar to those of *P. lycopersicella* were taken on nightshade (*Solanum nigrum*).

Several fields were observed in which both leaves and fruit of tomatos were also infested by *P.* (*G.*) *operculella*, Zell. (potato tuber moth), but it was generally less widespread and abundant than *P. lycopersicella*. A survey of tomato fields in two counties showed that every field was infested to some degree in 1930. No satisfactory control measure has so far been found.

Keifer (H. H.). **Another European** *Brachyrhinus* (*Otiorhynchus*) **appears in California.**—*Mon. Bull. Dept. Agric. California*, xx, no. 7, pp. 470–472, 2 figs. Sacramento, Cal., July 1931.

Otiorrhynchus (*Brachyrrhinus*) *meridionalis*, Gyll., which occurs in France, Spain and Italy, is recorded for the first time from several localities in California, adults having been taken on or under California

privet (*Ligustrum ovalifolium*). Both sexes have been found, though in the case of *O. cribricollis*, Gyll., *O. sulcatus*, F., and *O. rugosostriatus*, Goeze, no males have been observed in California [*cf. R.A.E.*, A, xix, 618]. A key is given to the adults of the five species of *Otiorrhynchus* known to occur in California, including *O. ovatus*, L.

Talbert (T. J.) & Swartwout (H. G.). **Spraying Investigations.**—*Bull. Missouri Agric. Expt. Sta.*, no. 301, 16 pp., 4 figs. Columbia, Mo., April 1931.

Oil sprays have proved valuable in Missouri as dormant, delayed dormant and summer applications. Delayed dormant applications of 2 per cent. lubricating oil emulsions have given as good control of Aphids on fruit trees as the use of ½ pint nicotine sulphate to 50 gals. of spray applied with summer dilutions of lime-sulphur, and may be used until the cluster-bud period. Cold-mix lubricating oil emulsion has been successfully used with Bordeaux mixture and also in lime-sulphur solution (1–1½ U.S. gals. in 50 U.S. gals. water with 1 lb. lead arsenate) without injury to foliage or fruit buds. If the application is delayed too long, however, the oil may be less effective as the Aphids may have crawled into the opening buds and be harder to reach. Lubricating oils at 1 per cent. strength were used on apples throughout the summer with the standard sprays (lead arsenate with lime-sulphur or with Bordeaux mixture), and in general the only heavy injury in the course of 7 years' use was at the calyx application, but in hot dry seasons or on certain varieties of apple serious injury to foliage and fruit was caused at other times. Dry lime-sulphur is of doubtful value in the control of San José scale [*Aspidiotus perniciosus*, Comst.], but is an efficient substitute for liquid lime-sulphur in summer sprays for apples, giving a higher finish to the fruit and avoiding injury. Spreaders used in sprays for apples and peaches did not give sufficiently improved results to justify their use.

Proper (A. B.). ***Eupteromalus nidulans*, a Parasite of the Brown-tail and Satin Moths.**—*J. Agric. Res.*, xliii, no. 1, pp. 37–56, 5 figs., 8 refs. Washington, D.C., 1st July 1931.

A general account is given of the Pteromalid, *Eupteromalus nidulans*, (Först.) Thoms., which was introduced into Massachusetts from Europe in 1905 for the control of the brown-tail moth, *Nygmia phaeorrhoea*, Don. [*cf. R.A.E.*, A, xviii, 151]. After numerous attempts at colonisation, it was found to be established in 1909, and wide dispersal was obtained shortly afterwards. It was, however, discovered to parasitise *Apanteles lacteicolor*, Vier., which is important in the control of *N. phaeorrhoea*, and further colonisation was stopped. Other primary parasites attacked by it include *A. melanoscelus*, Ratz., a common parasite of the gipsy moth [*Porthetria dispar*, L.], and *Meteorus versicolor*, Wesm., but field collections indicate that the percentage of parasitism of all these hosts is negligible. It also appears to be of little importance in the control of *Nygmia*, but there are indications that it may become of more value against the satin moth, *Stilpnotia salicis*, L., which it was first found to attack in 1926.

The following is taken from the author's summary: *E. nidulans* hibernates as a mature larva within the web or cocoon of its host. There may possibly be as many as two generations each year upon

primary parasites in the spring, and as many as three (the third hibernating in the fifth larval instar) upon *S. salicis* in autumn. It is also possible, however, that no reproduction may occur on primary parasites and only one or two generations on *S. salicis* in autumn. The average number of eggs deposited by 16 females was 251. The female forms a feeding tube through which the body fluid of the host is obtained. Adults fed on honey and water lived as long as 150 days, though the average was considerably less. All stages of the insect are described. Experiments carried out to determine whether *E. nidulans* deposited more eggs in webs of *S. salicis* or in cocoons of *A. melanoscelus* showed such variation that the results were inconclusive. The parasitism of *N. phaeorrhoea* rarely exceeded 1 per cent. over the infested area as a whole, but on *S. salicis* it ranged from about 2·4 to 9 per cent. *Pleurotropis* (*Entedon*) *albitarsis*, Ashm., has been bred from European material as an internal parasite of *Eupteromalus nidulans*, and in America *P. nawaii*, Ashm., has been reared in small numbers and on one occasion *P. tarsalis*, Ashm., was also obtained.

Rockwood (L. P.) & Zimmerman (S. K.). **A Seed Caterpillar, *Grapholitha conversana* Wlsm., on a native Clover in the North Pacific Region.**—*J. Agric. Res.*, xliii, no. 1, pp. 57–65, 5 figs., 9 refs. Washington, D.C., 1st July 1931.

In view of the possibility that some of the insects attacking the native leguminous flora of the North Pacific region may become pests of cultivated forage crops, an account is given of the history and distribution of *Cydia* (*Grapholitha*) *conversana*, Wlsm., with descriptions of all stages and some notes on bionomics. It has been found on the native clover, *Trifolium involucratum* var. *fimbriatum*, and occasionally on *T. pratense*, in Oregon and California. The larvae attack the flower heads, and in the case of the native clover the ovules and young seed pods are eaten, with consequent loss in seed production. There is one generation a year in Oregon, hibernation occurring in the pupal stage. No other clover-seed caterpillar has been observed in the western States, and the distribution of the native food-plant suggests that this Tortricid may occur in other districts west of the Rocky Mountains. Two Braconid parasites, *Orgilus mellipes*, Say, and *Microbracon hyslopi*, Vier., have been reared from it.

Division of Entomology.—*40th Ann. Rep. Washington Agric. Expt. Sta. 1929–30* (Bull. no. 245), pp. 30–34. Pullman, Wash., December 1930. [Recd. August 1931.]

Further investigations in Washington by R. L. Webster and W. W. Baker [*cf. R.A.E.*, A, xviii, 204, 541] on *Epitrix subcrinita*, Lec., and *E. cucumeris*, Harr., furnish additional evidence that the latter is not of economic importance on potatoes in the eastern part of the State. Both species, however, are found in the western part, *E. cucumeris* being by far the more abundant in localities where damage to the tubers has occurred in recent years.

Experimental work on oil sprays for dormant and summer use, reported on by A. Spuler, has already been noticed [xix, 580, 581]. The same author also very briefly discusses the results of experiments against *Cydia* (*Carpocapsa*) *pomonella*, L. [*cf.* xix, 91, 582].

Jackson (T. P.). **Work connected with Insect and Fungus Pests and their Control.**—*Rep. Agric. Dept. St. Vincent 1930*, pp. 7–10. Trinidad, 1931.

The minor pests occurring in St. Vincent during 1930 have been noticed in a previous report [*R.A.E.*, A, xv, 51]. On cotton, slight attacks of *Alabama argillacea*, Hb., were experienced. Infestation by *Platyedra gossypiella*, Saund. (pink bollworm) began 146 days after planting as compared with 129 in the previous season. The methods employed for the control of *Dysdercus discolor*, Wlk. (*delauneyi*, Leth.) were continued. The numbers of *Calpodes ethlius*, Cram., on arrowroot were negligible.

The Colorado Potato Beetle Order of 1931.—*Stat. Rules & Orders*, 1931, no. 879, 4 pp. London, 15th October 1931.

Owing to the rapid spread of the Colorado potato beetle (*Leptinotarsa decemlineata*, Say) in France, the importation of potatoes from any part of France into England or Wales is prohibited as from 15th March 1932. Nursery stock and living plants (including bulbs, cuttings, etc., but not cut flowers or vegetables for consumption) will be admitted only if they are officially certified not to have been grown within 200 kilometres of any place where *L. decemlineata* exists or has been known to exist ; and between 15th March and 14th October each year, the admission of raw vegetables, including tomatos, onions, aubergines and salads, will be subject to the same restriction.

Collinge (W. E.). **The Food and feeding Habits of the Land-rail or Corn-crake.**—*J. Minist. Agric.*, xxxviii, no. 6, pp. 618–621, 1 diag., 3 refs. London, September 1931.

A brief account is given of the life-history and economic status of the corn-crake [*Crex crex*] in the British Isles. An examination of 33 specimens shows that of the total food consumed between May and October (the approximate period during which the birds are present in the country), 82·5 per cent. is of an animal nature. Of this, 58 per cent. consisted of injurious insects, 8 per cent. of other pests and only 1 per cent. of beneficial insects. Among the injurious insects, cutworms, wireworms and larvae of the common earwig [*Forficula auricularia*, L.] and Tipulids were most abundant. These data definitely indicate the importance of protecting this bird.

Maylin (M.). **La courtilière** (*Grillotalpa vulgaris*). **Ses ravages. Moyens de destruction.**—*Prog. agric. vitic.*, xcvi, no. 37, pp. 254–259. Montpellier, 13th September 1931.

An account is given of *Gryllotalpa gryllotalpa*, L. (*vulgaris*, Latr.) (mole cricket), which is very destructive in the Toulouse region, and of the remedies practised against it. These consist of mechanical destruction, the use of baits, fumigation of the galleries, and poison baits, of which the most highly recommended is a zinc phosphide and broken rice mixture [*R.A.E.*, A, xviii, 45, 335].

Mesnil (L.). **Contribution á l'étude de trois coléoptères nuisibles aux céréales.**—*Ann. Epiphyties*, xvi (1930), no. 3–4, pp. 190–208, 5 pls., 42 refs. Paris, 30th April 1931.

Lema cyanella, L., and *L. melanopa*, L., which feed on the leaves of cereals in spring, although generally comparatively harmless, may, under the influence of certain unknown factors, become a serious menace to the crops. Descriptions are given of the adults and larvae of both species, together with a discussion of their geographical distribution and the measures employed against them, and keys showing the distinguishing characters of the two species, the differences between *L. cyanella* and *L. erichsoni*, Suffr., which it closely resembles, and the types of injury characteristic of each species in both adult and larval stages, which are compared with that caused by adults of *Phyllotreta vittula*, Redt., and *Chaetocnema aridula*, Gyll.

Adults of *L. cyanella* come out of hibernation in April or May, oviposit in the latter month and disappear in June. Although the author has never found this beetle on any cereal but wheat, it has been recorded on barley. Oviposition generally takes place on the upper surface of the leaves, and the incubation period does not exceed 10 days. Pupation occurs on the plants about the middle of June, and the adults emerge about the middle of July. They are often observed feeding during August on *Dactylis glomerata* before entering hibernation in various types of shelter.

Adults of *L. melanopa* appear irregularly from April till mid-May and are very active, feeding on the leaves of oats. Mating and oviposition follow immediately, the eggs being laid in pairs on the terminal leaves of young cereals. Neither larvae nor adults of this species have been found on wheat, but oats and barley appear to be equally attacked. The oviposition period is protracted, the last eggs being found at the beginning of June. They hatch in 7–8 days. Fully developed larvae were found feeding on oats up to the end of June. The injury caused is similar to that due to *L. cyanella*, but the furrows hollowed in the leaves are slightly longer. The number of adults present decreases steadily throughout June, when they are found feeding on *Lolium*, only a few surviving till early July, when the larvae descend into the soil to pupate at a depth of about $1\frac{1}{2}$ ins. Fully formed but immature adults were found in the soil from the beginning of August onwards, and it is probable that some of the beetles hibernate without leaving the pupal cocoon, thus accounting for the protracted emergence period and the lateness of the emergence date as compared with *L. cyanella*. Others, however, certainly emerge in August and feed on *Lolium* before hibernating. From the observations of other authors it appears that the life-history of *L. melanopa* varies considerably with the climate. In southern Russia and Hungary the beetles appear to develop much earlier and in England much later than in France. In regions subject to attack, infestation is not renewed regularly every year. Attacks appear to increase in severity for a few years and then decline till they cease altogether for an indefinite period. Control measures include the cultivation of winter wheat and spraying with a mixture of pyrethrum and nicotine sulphate. Copper arsenate and barium chloride gave indifferent results.

The only flea-beetle observed by the author to attack cereals was *Chaetocnema aridula*, a description of the adult and larva of which is given. The injury caused by the larvae to oats, the young plants

of which are attacked at the base, is also described. Serious injury was recorded for the first time in the neighbourhood of Paris in 1930. The first adults appeared in May, oviposition took place immediately and the larvae hatched at the beginning of June, feeding on oats and more rarely on wheat. They were not observed on barley. The eggs are probably laid on the upper surface of the lower leaves, the young larva descending towards the stem, in the lowest internode of which it is generally found. The gallery, the entrance of which is invariably found in the swollen portion of the node, first runs horizontally and then rises irregularly without going beyond the upper node. As many as three larvae have been observed together in a stem. At the end of June and beginning of July they descend into the soil to pupate, the adults emerging about mid-July. As cereals are ripe by this time and are incapable of supporting another generation, it is probable that these adults feed till autumn on wild grasses, on which they may reproduce. No control measures have yet been devised, but the removal of oats from the vicinity of meadows, crop rotation and early sowing are suggested.

CHAPPELLIER (A.). **Contenu du gésier de quelques jeunes freux** (*Corvus frugilegus* **Linné) tués près du nid avant leur envol.**—*Ann. Epiphyties*, xvi (1930), no. 3–4, pp. 209–218, 1 fig. Paris, 30th April 1931.

Insects found in the gizzards of young rooks (*Corvus frugilegus*), killed close to the nest and before they had taken flight, included *Melolontha melolontha*, L. (*vulgaris*, F.), *Amphimallus majalis*, Razoum. (*Rhizotrogus rufescens*, Latr.) and *Otiorrhynchus ligustici*, L., which seems to be particularly favoured. It is probable that on 3rd April, when *A. majalis* was found, the beetles had not yet emerged from hibernation, and it is suggested that the parent rooks located them in the soil by hearing their attempts to come to the surface. Since it has been determined that beetles are reduced to fine débris after 30 minutes in a rook's gizzard, the 83 individuals of *A. majalis* found in the gizzard of one young rook, which were still quite recognisable in the abdomen, must have been conveyed to it by the parent birds within a few minutes.

The quantity of insects that may be destroyed by a young rook in one day is very large, from 7 to 56 individuals of *Melolontha* having been found present at one time in single gizzards, which are evacuated 3–5 times in 24 hours.

M[ARCHAL] (P.). **La question des races du** *Phylloxera* **de la vigne.**—*Ann. Epiphyties*, xvi (1930), no. 3–4, pp. 232–234, 2 refs. Paris, 30th April 1931.

Observations by A. Vandel in regard to the races of *Phylloxera* on vines, included in the chapter on cyclic parthenogenesis contained in the monograph noticed below, are quoted in full. After reviewing the work of earlier authors, Vandel discusses the publications of Börner [*R.A.E.*, A, xi, 342, 433] in which he maintained the existence of two distinct species of *Phylloxera* hitherto confused under the name of *P. vastatrix*, Planch. The conclusions of Börner have been criticised by various authors, who have shown that the morphological characters advanced by him to separate the two species are inadequate [xv, 559].

As regards the distinguishing biological characters recognised by Börner, *Phylloxera* of the northern race failed to develop on Italian vines, but Italian observers succeeded in infecting no. 3309, declared by Börner to be immune, with individuals of this same race [xii, 188, 557]. They consider further that the results obtained by Börner may be explained by the different behaviour of direct and indirect gallicolae [xii, 189].

It may be concluded from these contradictory findings that there are not two morphologically distinct species of *Phylloxera*, but, on the other hand there may be two biological races that behave differently on American and European vines. In this case the question of their origin remains to be solved. According to Börner they were imported from America, where they already possessed all their characters, but other authors suggest that these have been developed in Europe in consequence of their new surroundings [xii, 556; xiii, 152]. The necessity for further investigation to determine the relative parts played by heredity and environment in the diverse behaviour observed in the life-cycle of *Phylloxera* is insisted upon.

Vandel (A.). **La Parthénogenèse.**—F'scap 8vo, xix+412 pp., 42 figs., 55 pp. refs. Paris, G. Doin & Cie, 1931. Price *Fr.* 32.

This work, which, with the exception of two chapters on experimental parthenogenesis and parthenogenesis of plants, deals with natural animal parthenogenesis in all its types and aspects, is very largely concerned with the development of this phenomenon as observed in insects. After discussing the discovery, interpretation, definition and extension of parthenogenesis, the author proceeds to classify the different types of this form of reproduction into arrhenotokous and thelyotokous sometimes deuterotokous) parthenogenesis, and the latter again into cyclic, accidental or optional, and geographical parthenogenesis, paedogenesis and parthenogenesis of the Nematode type. Each type is dealt with in detail, and a chapter is devoted to the determination of sex in respect of each. The cytology of natural parthenogenesis is also discussed.

Oudemans (A. C.). **Acarologische Aanteekeningen cvii.** [Acarological Notes, cvii.]—*Ent. Ber.*, viii, no. 178, pp. 221–236. Amsterdam, 1st March 1931.

The mites dealt with include *Tetranychus fragariae*, sp. n., on Alpine strawberry in Holland.

Zwölfer (W.). **Zur Theorie der Insektenepidemien.** [Contribution to the Theory of Insect Outbreaks.]—*Biol. Zbl.*, l, pp. 724–759. Leipzig, 1930. (Abstract in *Zbl. Bakt.*, (2) lxxxiv, no. 15–18, pp. 426–427. Jena, 10th August 1931.)

This paper, which discusses mathematical formulae suggested by Bremer [*R.A.E.*, A, xvii, 205], should be consulted in the original. The author has found that in the fluctuations in the numbers of insects, the average number of the progeny is only of secondary importance, as compared with variations in the environmental resistance. Formulae for calculating this resistance and the rate of increase of insects under given conditions are discussed in detail.

Lüstner (G.). **Die wichtigsten tierischen Schädlinge der Rosen und ihre Bekämpfung.** [The most important Pests of Roses in Germany and their Control.]—*Flugbl. Biol. Reichsanst. Land- u. Forstw.*, no. 115–116, 8 pp., 14 figs. Berlin, April 1931.

Brief notes are given on the bionomics and control of the following pests of roses: *Aulacaspis rosae*, Bch., *Lepidosaphes ulmi*, L., and *Lecanium* (*Eulecanium*) *corni*, Bch., which infest the stems; the sawflies, *Monophadnus elongatulus*, Klug, and *Ardis bipunctata*, Klug, which bore in the shoots, and the Cynipid, *Rhodites rosae*, L., which produces the well-known fringed galls on them; the gall-midge, *Thomasiniana* (*Clinodiplosis*) *oculiperda*, Rübs., which mines the tissues at the point of grafting; *Tortrix bergmanniana*, L., *Nepticula centifoliella*, Zell., *Hylotoma rosae*, L., *Blennocampa pusilla*, Klug, *Typhlocyba rosae*, L., and *Macrosiphum* (*Siphonophora*) *rosae*, L., which attack the leaves; *Cetonia aurata*, L., which destroys the flower-buds; and *Cydia* (*Grapholitha*) *roseticolana*, Zell., which feeds inside the fruits.

Klemm (M.). **Zur Kenntnis der Schädlichkeit der Pflaumensägewespe** (*Hoplocampa minuta* **Christ).** [A Contribution to the Knowledge of the Injuriousness of the Plum Sawfly (*H. fulvicornis*, Panz.).]—*Gartenbauwiss.*, iii, p. 259. Berlin, 1930. (Abstract in *Z. Plfanzenkr.*, xli, no. 8, pp. 402–403. Stuttgart, 1931.)

On the basis of observations on the plum sawfly, *Hoplocampa fulvicornis*, Panz. (*minuta*, Christ), carried out in Berlin in 1929, and data from the literature [*R.A.E.*, A, xv, 557; xvii, 59], the author concludes that the chief blossoming period of plums occurs when the average day temperature reaches a point above 12° C. [53·6° F.]. The considerable decrease in infestation of the fruit in 1929 was due to the fact that this temperature was reached a fortnight later than in 1928, whereas the sawflies emerged at the same time in both years. Usually the infestation is of economic importance if its maximum occurs after the physiological fall of fruits is over. Certain varieties of plums were more severely infested than others.

Stellwaag (F.). **Die Milbenkräuselkrankheit des Rebstockes in ihrer Differentialdiagnose gegenüber ähnlichen Schäden im Weinbaugebiet der Rheinpfalz.** [The Mite Crinkle Disease of the Grape-vine and the Characters differentiating it from similar injuries in the Vine Districts of the Rhine Palatinate.]—*Anz. Schädlingsk.*, vii, no. 7, pp. 73–77, 10 figs., 5 refs. Berlin, 15th July 1931.

In the spring of 1931, *Epitrimerus vitis*, Nal., was common on the young leaves of vines in the Rhine Palatinate. The general effect of the infestation, which caused crinkling of the leaves, thickening of the shoots and stunted growth, is described. Some of the stunted growth may also have been due to somewhat similar injury caused by *Eriophyes vitis*, Pgst., or to attack on the shoots by *Byctiscus betulae*, L., defoliation by *Sparganothis pilleriana*, Schiff., and root-injury by Coleopterous larvae, but these were all more or less unimportant.

Friederichs (K.). **Zu den Meinungsverschiedenheiten über die Bewertung der einzelnen die Vermehrung von Insekten begrenzenden Faktoren.** [Differences of Opinion on the Valuation of the individual Factors limiting the Increase of Insects.]—*Anz. Schädlingsk.*, vii, no. 7, pp. 77–80, 9 refs. Berlin, 15th July 1931.

Some instances relating to individual insects are given to show that differences in environment alter the relative importance of controlling factors, so that it would appear that the natural balance results from various combinations of an unstable association of animate and inanimate influences.

Růžička (J.). **Einige Gedanken zur Nonnenforschung.** [Some Thoughts on Nun Moth Investigations.]—*Anz. Schädlingsk.*, vii, no. 7, pp. 81–82, 18 refs. Berlin, 15th July 1931.

This is a criticism of several recent observations on the nun moth [*Lymantria monacha*, L.] and its control that are contrary to the author's experience in forests in Bohemia. Against the view that *L. monacha* was not originally specific to spruce, it is pointed out that the larvae leave pine and oak for it. The micro-climate of a pine forest is usually warmer than that of a spruce forest, and it is therefore, more favourable to the moth where the general local climate is cold. In the present cycle of warm years, in Bohemia, the local climate is warmer and the micro-climate of spruce more favourable than that of pine. Consequently at present the optimum micro-climate lies at an altitude (about 1,800 ft.) that was formerly considered the limit for the moth, which then occurred in the pine forests below spruce. The larval stage is the one most influenced by the micro-climate ; the eggs are not affected at all. Healthy larvae are only affected indirectly, through their Tachinid parasites, which are very susceptible to climate, continued dry weather diminishing fertility. Larvae suffering from polyhedral disease, however, are directly affected by rain and cold. Wilke's statement that it is only spruce forests in the deciduous tree zone that are susceptible to attack [*R.A.E.*, A, xix, 510] is disproved by the fact that spruce in its natural habitat was destroyed in Bohemia in 1917–22, whereas spruce in unsuitable situations remained untouched. Outbreaks depend solely on climate favourable to the nun moth and unfavourable to its natural enemies. It is better to have small stands than large ones, as the edges are often in good condition while the centre is defoliated. The admixture of larch, or Douglas fir [*Pseudotsuga taxifolia*] where possible, in stands of spruce is advocated, as these trees appear immune from attack.

v. Butovitsch (V.). **Beiträge zur Bekämpfung und Biologie des grossen braunen Rüsselkäfers,** *Hylobius abietis* **L.** [Contributions to the Biology and Control of *H. abietis*.]—*Mitt. Forstwirt. u. Forstwiss.*, Hanover, 1931. (Abstract in *Anz. Schädlingsk.*, vii, no 7, pp. 83–84. Berlin, 15th July 1931.)

The pine weevil, *Hylobius abietis*, L., is a serious pest of newly planted young conifers in Germany. The methods of control (chiefly traps of various kinds) used in North Germany have been tested, and the conclusions reached as to their relative value are given, together

with the results of an investigation regarding their cost. The most satisfactory was found to be a trap-trench surrounding the felled area, with trap pits ($3 \times 3 \times 3$ ft.) dug at intervals of 15–20 yards along it and filled with twigs dusted with calcium arsenate.

MALENOTTI (E.). **Osservazioni sui rapporti fra** *Diaspis pentagona* **Targ. e** *Prospaltella berlesei* **How.** [Observations on the Relations between *Aulacaspis pentagona* and *P. berlesei*.]—*Atti Accad. Agric. Sci. Lett. Verona*, (5) ix, pp. 97–106. Verona, 1931.

The local failure of *Prospaltella berlesei*, How., to control *Aulacaspis* (*Diaspis*) *pentagona*, Targ., on mulberry in some parts of the province of Verona, North Italy, chiefly owing to dust from motor traffic [*R.A.E.*, A, xv, 377], has been investigated. Tarring the roads has resulted in the re-establishment of control. Much of the injury done to mulberry by Coccids along dusty roads is due to *Aspidiotus hederae*, Vall., which is checked by *Aspidiotiphagus citrinus*, Craw, and this parasite suffers from dust like *P. berlesei*. Inspection showed that in 24 localities in Central Italy, *P. berlesei* had suffered no set-back at all.

MALENOTTI (E.). **Le polveri arsenicali contro il bombice dispari. Primo esperimento in Italia con distributore di polvere a motore contro gl'insetti dei boschi.** [Arsenical Dust Insecticides against *Porthetria dispar*. The first Experiment in Italy with a power Duster against Forest Insects.]—*Riv. mens. Touring Cl. ital.* "*L'Alpe*," March 1931, reprint 11 pp., 13 figs. [? Florence] 1931.

An oak forest of about 7 acres near Rome seriously infested by larvae of *Porthetria* (*Lymantria*) *dispar*, L., was treated with calcium arsenate dust on 9th May 1930. The dust was all applied in two hours by means of a power duster, and about 95 per cent. of the larvae were killed. The predacious Carabid, *Calosoma sycophanta*, L., was present in abundance and appeared capable of destroying the few larvae that survived. A previous inspection in December 1929 had shown that eggs of *P. dispar* were very numerous, 2–3 per cent. being parasitised by the Eupelmid, *Anastatus disparis*, Ruschka.

MALENOTTI (E.). **La lotta contro la piralide del mais resa obbligatoria in sei province adriatiche.** [Measures against the Maize Pyralid made compulsory in six Adriatic Provinces of Italy.]—*Giorn. Agric. Domenica*, no. 7, 15th February 1931, reprint 6 pp. Piacenza, 1931.

A decree, dated 20th January 1931, requiring the clearing of all maize stubble as a measure against *Pyrausta nubilalis*, Hb., in Udine, Venetia, Treviso, Padua, Rovigo and Ferrara, is reproduced. This entails the use of a special spade for removing the whole of the stubble [*R.A.E.*, A, xvii, 217] and care to avoid infestation from stored stubble. In Venetia *P. nubilalis* appears to have developed a biological race that attacks only maize and dahlias, the latter being unimportant. In Ferrara hemp is attacked, but hibernation cannot occur in the stalks, and it is only infested when near maize. *Artemisia vulgaris* is very common in Venetia, but the larvae have not been found in it there.

PUNTONI (V.). **Infestation des cultures de champignons par des acariens du genre** *Tarsonemus.* **Préservation de ces cultures.**—*Ann. Paras. hum. comp.*, ix, no. 4, pp. 359–362, 1 fig. Paris, July 1931.

The author gives an account of an infestation of various fungus cultures in Rome by mites of the genus *Tarsonemus* (probably a variety of *T. floricolus*, C. & F.). The mites pass from one tube to the next through the cotton wool stoppers and may transport spores and other germs and so bring about contaminations that may cause the loss of the cultures. Experiments showed that the mites could be destroyed by pouring 10–20 drops of rectified benzine or xylol on the bottom of the cotton wool stoppers and replacing them in the vials. The mites were killed in 5–6 minutes, and no damage to the cultures was observed. No experiments have been made to test the action of these fumigants on the eggs of the mites, but cultures treated with them have shown no re-infestation. Further tests showed that re-infestation after the complete evaporation of the benzine could be prevented by using stoppers soaked in kerosene, squeezed out and left exposed to the sun or air for several hours until apparently dry. The traces of kerosene are sufficient to repel the mites and do not affect the cultures. Cultures kept in this way remained free from mites during an observation period of 3½ months, whereas of 20 cultures under the same conditions but not protected, 14 became infested.

SÜREYYA (M.) & HOVASSE (—). **Les ennemis des pins aux Iles des Princes.** [*Also in Turkish.*]—Demy 8vo, 32 pp., 6 figs., 2 refs. Stamboul, Sirketi Mürettibiye Matbaasi [1931].

Notes are given on the insects attacking pines in Princes Islands, in the Sea of Marmora, where these trees are chiefly important as ornamentals. The Coccid, *Marchalina hellenica*, Genn., which has one generation a year and reproduces parthenogenetically, oviposits in May, one female producing between 200 and 300 eggs. The larvae suck the sap from the bast. The greatest damage is done during the spring and is due not only to the extraction of sap but also to the encouragement of sooty moulds (especially *Capnodium pini*). Pines are the only food-plants, *Pinus halepensis* and *P. sylvestris* being preferred. The larvae are attacked by those of the Agromyzid, *Leucopis* sp., and the beetle, *Dasytes flavipes*, Ol.; it is suggested that these natural enemies should be encouraged and that old, infested trees should be replaced by species, such as *Pinus pinea*, that are not susceptible to infestation. Another Coccid, *Leucaspis loewi*, Colv., is of minor importance, attacking the needles of unhealthy pines.

The larval nests of *Thaumetopoea pityocampa*, Schiff., are found from September onwards at the ends of pine branches. At the end of May the larvae leave them and pupate in the soil, the adults emerging two months later. The collection and immediate destruction of the nests is advocated, or, better still, the nests should be taken to a distance too great for the larvae to return to the pines in one night; in this way the larvae die of hunger and certain Dipterous and Hymenopterous parasites, which are not in themselves a sufficient control, are enabled to escape and continue their activities. *Dendrolimus* (*Lasiocampa*) *pini*, L., has been recorded from the Islands, but is of no importance there. The adults of *Rhyacionia* (*Retinia*) *buoliana*, Schiff., occur in

May and June and oviposit on the terminal shoots, in which the larvae feed. The latter are active, except in the coldest part of the winter, until April, when they pupate. The injury consists of deformation of the branches and stunting of the growth, but the moth is not as yet widespread.

The most dangerous pest is *Myelophilus piniperda*, L. In spite of a thorough campaign following a severe outbreak of this Scolytid some ten years ago, a few foci of infestation still remain, constituting a permanent menace to the pines. The adults appear in the first half of May and attack the terminal branches of diseased or weak trees, which they pierce to the pith, on which they feed, constructing a feeding gallery. Resin flows from the entrance hole, the leaves turn yellow and the infested branches break off in the wind. Feeding continues throughout the summer, and in autumn the beetles leave the branches and at the base of the trunk construct short galleries to the bast, where they remain until February. With the first warm days they emerge, and the females after pairing choose a weak spot such as a hole in the bark, which they pierce to the bast and there construct an oviposition gallery about 4 ins. long, with a few holes to the exterior. Oviposition continues during the first half of March, one female depositing from 50 to 100 eggs. The larvae mine away from the mother gallery, and after about six weeks of feeding, pupate in chambers in the bark of the trunk or the wood of a branch. The adults emerge through an exit bored horizontally at the level of the pupation chamber. Although some writers have recorded two generations in a year, the authors have found only one in Princes Islands. The injury consists of suppression of the terminal shoots, or death of the tree owing to complete destruction of the bast. Every heavily infested tree should be cut down, and the bark removed and burnt before the insects can escape. Trap trees should then be laid on the ground before the beginning of February, and after oviposition is over both adults and larvae should be destroyed by burning the bark. A few of the insects are eaten by woodpeckers working on the pines. Every effort should be made to keep the trees healthy, for strong trees are never attacked. *M. minor*, Htg., and *Ips erosus*, Woll. (*Tomicus rectangulus*, Eichh.) have been found on the trap trees, but the former is rare and the latter not dangerous. Infestation by *M. piniperda* is frequently followed by attacks of *Marchalina hellenica* and also of *Sirex juvencus*, L., which requires at least two years for development.

WILKINSON (H.). **The Control of the Cutworm.**—*Bull. Dept. Agric. Kenya*, no. 12 (1931), 5 pp. Nairobi, 1931.

In Kenya Colony considerable loss is caused to coffee, wheat, vegetables and maize by the cutworms, *Euxoa segetum*, Schiff., *E. spinifera*, Hb., *Polia inferior*, Guen., and *Prodenia litura*, F. Generations are irregular throughout the year, and caterpillars can be obtained at almost any time, being most numerous towards the end of April, and in May and June. The remedy almost universally recommended is a poison bait, and the method of preparing one of sodium fluoride and chopped prickly pear [*R.A.E.*, A, xiii, 39] is given. The use of a bait of 1 lb. Paris green and 60 lb. bran has met with considerable success in Kenya. Sufficient water should be added to make the mixture soft but not too moist. It dries out rapidly and should be

used in the late afternoon, about 20 lb. dry weight being required to the acre. The bait is also effective against *Dasus* (*Gonocephalum*) *simplex*, F.

Maize planted within about three weeks after the advent of the long rains grows rapidly and suffers little from the attacks of cutworms. To meet the objection that large areas cannot be planted within this time, the author shows that if a crop is planted in April, it may be harvested and the land ploughed in November, and this allows a period of four months in which to prepare for planting in March, when, in normal seasons, the rains occur. A number of advantages result from the use of this programme, including destruction of weeds on which eggs are deposited, by exposure to the sun from December to March, and the establishment of a close season, which is of great importance in the control of the maize stalk borer [*Busseola fusca*, Fuller]. The equipment and labour necessary for planting 1,000 acres in 30 days is briefly discussed.

When the cutworms are numerous, they may be collected by hand at very little cost, 17 men covering 100 acres in a day. It is important to ascertain whether infestation is present when the young plants first appear and before the damage is done.

de Joannis (J.). *Evergestis occidentalis*, **n. sp., parasite des choux, au Maroc.**—*Bull. Soc. Sci. nat. Maroc*, x, no. 7–9, pp. 148–149. 1 pl. Rabat, 1931.

A Pyralid closely allied to *Evergestis infirmalis*, Stgr., has recently been observed attacking cabbages and cauliflowers in Morocco, and is here described as *E. occidentalis*, sp. n. The characters distinguishing the two species are given. Adults reared from other larvae observed at the same time feeding on cabbage leaves were identified as *Eublemma velox*, Hb., but as these and other individuals taken in different parts of Morocco exhibit a slight variation in colour from the typical form, they apparently represent a geographical race and are named *E. velox* var. *vinacea*, n.

Bouhelier (R.) & de Lépiney (J.). **Note complémentaire sur** *Evergestis occidentalis* **Joann.**—*Bull. Soc. Sci. nat. Maroc*, x, no. 7–9, pp. 150–152, 1 fig. Rabat, 1931.

The external characters of the larvae of *Evergestis occidentalis*, de Joann., are described from material taken in many localities on the west coast of Morocco. Cabbages are generally attacked by this Pyralid at the top of the stalk, of which the inside, at the point where the leaves grow out, is often completely eaten away ; the parenchyma of the leaves is also devoured. On turnips, the larvae enter the shoot and descend to the root, the soft, central part of the tap-root being eaten out. Radishes and wallflowers (*Cheiranthus cheiri*) are also attacked. The pupal stage occurs in the soil and lasts from 10 to 16 days. Evidence indicates that there may be two generations in a year. Parasites, which are somewhat irregular in their activities, include a Braconid and an Ichneumonid.

Bouhelier (R.). **Observations sur le régime alimentaire de quelques Macrolépidoptères parasites en Chaouia.**—*Bull. Soc. Sci. nat. Maroc*, x, no. 7–9, pp. 153–155. Rabat, 1931.

A list is given of the food-plants of 16 species of Lepidoptera in Morocco, with brief notes in some cases on the injury caused.

Robinson (J. M.). **The Trend in entomological Activities in the Cotton States.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 786–789. Geneva, N.Y., August 1931.

A brief review is given of current development in entomological activities in the cotton-growing areas of the United States in respect of research, quarantines, dissemination of insect control information and improved facilities for the training of entomologists.

McDonald (R. E.). **The present Status of the Pink Bollworm in the Southwest.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 790–795. Geneva, N.Y., August 1931.

The present distribution of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., in Mexico and the south-western part of the United States is discussed, and the intensity of the infestation in each area, as revealed by the mechanical inspection of gin trash [*cf. R.A.E.*, A, xix, 616], is indicated. Apparent control in certain areas is largely due to seed disinfection and cleaning of points of concentration, aided by very low winter temperatures. A summary is given of efforts made to eradicate, by means of cleaning operations, the constitution of a non-cotton zone and delayed planting dates in the restricted zone, a comparatively heavy infestation discovered in the eastern end of the Salt River valley, Arizona, in 1929. The climate of this area is subtropical and "stub" cotton is often produced for several years without replanting. Great difficulty was experienced in preventing sprouting from the roots, for which ordinary ploughing methods proved inadequate. The propagation of *P. gossypiella* continues without interruption from about 1st April, when the sprouting cotton is usually fruiting profusely, until December. Examinations in the autumn of 1930 revealed a number of light infestations, involving a much larger area than that affected in the previous year. The programme adopted for dealing with these in 1931 is outlined ; it consists of winter cleaning, ploughing and irrigation of cotton fields within about 3 miles of an infestation, prevention of growing of "stub" cotton, and delay of planting until the peak of emergence has passed.

A brief account is also given of scouting done in Mexico in co-operation with the Mexican Department of Agriculture to determine the distribution of *P. gossypiella* on cotton and wild food-plants. Although *Hibiscus cardiophyllus* and *Abutilon hypoleucum* were found to be infested in certain regions in Mexico, it does not appear that *P. gossypiella* could survive upon them in the absence of cotton.

Isler (D. A.) & Fenton (F. A.). **Preliminary Report on controlling Pink Bollworm in Texas by Winter Cultural Methods.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 795–807, 2 pls., 1 chart, 1 ref. Geneva, N.Y., August 1931.

The results of work on the effects of ploughing and irrigation in the control of *Platyedra* (*Pectinophora*) *gossypiella*, Saund., carried out from

1928 to 1930 in Presidio, Texas, are discussed. In these cultural control tests, which are comparable with those on hibernation already noticed [*R.A.E.*, A, xviii, 309], the main factors considered were the time of year and the depth of ploughing, a limited additional amount of work being done in 1929–30 with reference to types of ploughs.

The following is taken from the authors' summary: Survival of *P. gossypiella* from all treatments was much lower in the second year than in the first, and for both years was markedly lower in light soils than in clay soils. A high natural mortality occurred in breeding material left undisturbed on the surface. Irrigation alone of surface litter gave no control, but rather increased larval survival over that left dry. When no irrigation water was applied, early winter ploughing increased survival, whereas late spring ploughing decreased it to some extent. Ploughing followed as soon as possible by irrigation gave very good control, with very little difference shown between the various dates at which the operations were carried out. When irrigation was delayed longer than one month after ploughing a gradual increase in survival was noted for each increased period of delay. The most effective control seemed to result when ploughing was delayed as late in the spring as possible, securing the maximum effect of natural winter mortality, and was then followed by irrigation. In the ploughing experiments during the two years' work as a whole, 6-inch ploughing was more effective than either 4- or 8-inch ploughing, but the most effective depth varied with the type of plough used. The disk plough gave the least effective results.

Folsom (J. W.). **Damage to Cotton by Crickets.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 807–815, 1 pl. Geneva, N.Y., August 1931.

Gryllus assimilis var. *pennsylvanicus*, Burm., was unusually abundant and locally destructive to cotton in Louisiana in 1930. Injury was first noticed in one plantation during the first week in July, after two months of drought. After rain during August, the plants recovered rapidly, but the yield of cotton had been reduced by 19th November in the most heavily infested areas to one-third of that produced from uninfested plants. Characteristic damage caused by the crickets, which devour and sever the foliage, gnaw into stems and squares and eat large holes out of bolls, is described in detail. Many small plants were defoliated or killed outright, but on larger plants, 1 or 2 feet in height, only a comparatively small number of leaves was eaten, usually on the lower part of the plant. In the daytime the crickets entered cracks formed in the ground by the drought, but in cages over cotton plants, it was possible to produce sufficient shade to induce activity during the daytime for observation purposes. Stridulation, mating, oviposition and hatching are described in detail. The first nymphal instar lasted 4–7 days and the second 5–10, no records of the third being available. The mortality of young nymphs reared in petri dishes was very great. Of 177 eggs hatching in the insectary, 62 per cent. hatched on 11th or 12th August. Adults gradually decreased in the field as the new generation developed, only 30 per cent. of the crickets counted on 28th August being adult. Crickets of the new generation were only half-grown at the coming of winter, and some of these dug burrows 1–3 inches deep in the soil after the rain had closed

the cracks, although many sought shelter on the surface. All nymphs found in the burrows were males.

No permanent reduction in the number of crickets present was achieved by ploughing or surface cultivation. A considerable reduction was, however, effected by dusting from aeroplanes at the rate of 8 lb. per acre with calcium arsenate and a mixture of calcium arsenate and Paris green, 3 : 1. The best time for dusting was just before sunrise, when the air is calm and there is dew on the plants. No benefit was apparent until some days after the application. In cages, mortality of adult crickets on dusted cotton plants was greatest on the third or fourth day, and all died within 8 days. In tests with a bait of 50 lb. bran, 2 lb. Paris green, 1 U.S. gal. molasses and 6 U.S. gals. water, broadcast at dusk on twelve successive rows of plants covering an area of 1,800 sq. ft., the number of crickets present was reduced from 16,008 to 762 in six days. The crickets flocked to the bran mash from adjacent untreated rows.

Thomas (F. L.) & Dunnam (E. W.). **Factors influencing Infestation in Cotton by** *Heliothis obsoleta* **Fab.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 815–821, 6 refs. Geneva, N.Y., August 1931.

Studies have been made over a period of three years in Texas to determine the factors influential in bringing about an infestation of cotton by *Heliothis obsoleta*, F., concerning which there has hitherto been no definite knowledge. Experimental evidence shows that the proximity of maize to cotton has no relation to infestation, and that egg parasites, although valuable under some conditions, are not so important as the factors influencing egg deposition. It was proved that neither honeydew nor nectar was responsible for the attraction of the moths, but it became apparent that the larvae of *H. obsoleta*, throughout their growth, desire succulent food, which seems to be essential for their normal development. Examples of this may be seen when a heavy infestation occurs on cotton that has been severely injured by flea-hoppers [*Psallus seriatus*, Reut.] and has consequently developed succulent growth, and on young cotton before bolls have had an opportunity to form. In the absence of bolls, the larvae, just before reaching maturity, eat into the succulent stems just below the tops of the plants, causing them to break over. It also appears that plants with succulent growth are attractive to the moths when laying eggs. The association of rainy weather in July with bollworm injury is probably due to the fact that such rains cause an increase in the growth of the plants at a time when the moths are ovipositing. It is not uncommon for cotton to escape injury in dry weather, although emergence of the moths may be greater than in wet weather. Such lack of infestation is due to the selective instincts of the moths. In cotton fields in which tomato plants were scattered, much larger numbers of eggs were laid on the fairly succulent tomatos than on the less succulent cotton, and in general, cotton grown on upland fields was less injured than that grown on low-lying land. With the overflow of rivers a supply of rich alluvial soil and an abundant supply of moisture render the cotton attractive to bollworms. Odours emanating from rapidly growing succulent cotton appear to be the most important factor influencing its infestation by *H. obsoleta*.

Ewing (K. P.). **Cage Tests of the Effectiveness of insecticidal Dusts for the Control of the Cotton Flea Hopper.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 821–827, 2 pls., 1 graph, 3 refs. Geneva, N.Y., August 1931.

The following is taken mainly from the author's abstract and summary: A new method of conducting toxicity tests for the control of *Psallus seriatus*, Reut. (cotton flea-hopper), which proved satisfactory in Louisiana in 1930, is described. Small cages, 18 ins. square and 24 ins. high, covered with fine-mesh brass wire cloth and designed to rest on a stool so as to enclose a *Croton* or cotton plant 3 ft. high, were used, and about 50 insects were placed in each cage. The high mortality that had hitherto occurred under cage conditions, owing to the fact that large numbers of the nymphs flew to the top of the cage and were unable to find their way back to the plant, was reduced to less than 10 per cent. at the end of 4 days by allowing the food-plant to touch the top of the cage.

A total of 193 tests was completed with 15 insecticides or combinations of insecticides and 2 inert materials used as dusts, the materials being applied from outside the cage at the rate of 12 lb. to the acre. Though the experiments were of a preliminary nature, they indicated that dusts containing 4 per cent. nicotine were very effective in killing both adults and nymphs, whereas those containing 2½ per cent. were considerably less effective. Sulphur was very much more toxic to nymphs than to adults, each of the three grades of superfine sulphur being more toxic than flowers of sulphur. High percentages of mortality were secured with both sodium fluosilicate and a commercial mixture of calcium arsenate and Paris green (3 : 1), but the results obtained will have to be verified by further tests under field conditions. The results with the commercial arsenical mixture did not tally with those secured with a home-made mixture in the same proportions. Neither barium fluosilicate, pure calcium arsenate nor any home-mixed Paris green combinations showed any promise.

Folsom (J. W.). **A Chemotropometer.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 827–833, 1 pl., 1 fig. Geneva, N.Y., August 1931.

The following is the author's abstract: A simple form of chemotropic apparatus and its method of operation are described. Records of chemotropic reactions of *Anthonomus grandis*, Boh. (Mexican boll weevil) obtained with this apparatus are given.

Hinds (W. E.). **A new economic Species attacking Soybean Hay in Louisiana** (*Herculia psammioxantha* **Dyar**).—*J. Econ. Ent.*, xxiv, no. 4, pp. 833–835, 1 pl. Geneva, N.Y., August 1931.

Injury caused for several years to soy-bean hay in southern Louisiana, which became severe in 1929, has been found to be due to *Herculia psammioxantha*, Dyar, a Pyralid not previously known to be of economic importance. The damage hitherto reported has been to hay in the stack in the field or in barns, and has generally been confined to the exterior of the bales and stacks, though the amount of penetration would probably depend on the hardness of the stalks of

the soy-beans and the looseness of the mass. The locality in which the moth is most common is also that of the heaviest attack of *Anticarsia gemmatalis*, Hb. The original description of *H. psammioxantha*, which appears to have other food-plants and to have been introduced into the coast region of the Gulf of Mexico, probably from Cuba, is given. It is also known to occur in British and French Guiana. Its suggested tropical origin appears to be confirmed by the fact that the larvae disappear immediately after the first heavy frost in Louisiana. It is not known whether it hibernates there, but the infestation of 1930 was as serious as that of 1929, in spite of the severity of the intervening winter.

STRACENER (C. L.). **Economic Importance of the Salt-marsh Caterpillar** (*Estigmene acraea* **Drury**) **in Louisiana.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 835–838, 1 pl., 4 refs. Geneva, N.Y., August 1931.

A study has been made of *Estigmene acraea*, Dru., in Louisiana, where cotton and soy-beans (*Glycine hispida*) are most severely attacked, although the larvae will feed on almost any green plant when their preferred food becomes scarce. Infestations usually start in pastures or weedy areas, where the larvae feed on various grasses and wild leguminous plants. Although some weeds, such as *Amarantus spinosus*, *Cassia tora* and *Eupatorium capillifolium*, are plainly preferred food-plants, they will be ignored when surrounded by leguminous plants or cotton. Damage to the latter amounting to 20 per cent. of the crop was reported in 1930, injury being chiefly due to migrating larvae. The most heavily infested area was within 60 miles of the coast, but heavy infestations also occurred along the Mississippi river bed. Maize planted with soy-beans was only attacked after the soy-beans were destroyed. Previous records of infestation of various food-plants in the United States, including vegetables and tobacco, are cited.

Brief descriptions of the adults and larvae are given. Mating occurs during the night following emergence, and egg deposition usually begins during the second night. Females live 4–5 days after oviposition begins and may deposit more than one batch of eggs. The males live only 3–4 days after mating and appear to mate only once. Eggs generally hatch in 4 days, and the life-cycle is usually complete in 6 weeks. There appear to be 3 generations a year in Louisiana, the most severe damage to crops being caused by the second. The period of injury occurs principally between 20th May and 1st July. The larvae may be distributed by the wind when hanging from a thread of silk, and the older ones by crawling over vegetation in search of food.

At first the larvae feed mainly on the lower surface of the leaves, but later they begin to feed rather from the edges and may be easily controlled. Sodium fluosilicate has been found to possess considerable advantages over the arsenicals hitherto used for this purpose. Three heavy applications made within 8 days while the dew was on the plants did not cause any scorching of cotton. Care was taken that no arsenical had been used in the dust guns or became mixed with the fluosilicate, as any mixture of calcium arsenate with sodium fluosilicate results in the liberation of free arsenic, which would cause defoliation of cotton or any other crop.

Robinson (J. M.) & Arant (F. S.). **Methods in rearing *Diabrotica*.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 839–843, 1 pl., 9 refs. Geneva, N.Y., August 1931.

Previous methods employed by various workers in rearing *Diabrotica* spp. are reviewed from the literature, and an improved method devised to facilitate quick and easy observation of the developing larvae of *Diabrotica duodecimpunctata*, F., and *D. balteata*, Lec., is described in detail. Adults are confined in glass vials 114 mm. high and 40 mm. in diameter. A circular piece of moist blotting paper is placed at the bottom of each vial for oviposition, a cotton plug wrapped in clean cheesecloth is placed in the mouth, and leaves of beans, cucurbits, tomato and other plants are used for food. For incubation eggs are placed on moist cotton in vials 60 mm. high and 30 mm. in diameter, and larvae are reared in vials of the same dimensions. Upon hatching the young larvae are placed on sprouting maize. The grain rests on the bottom of the vial and the absorbent cotton used to maintain moisture is placed on it in such a way that the sprout grows up between the side of the glass container and the cotton. Roots are produced beneath the cotton, and larvae feeding upon them can be readily observed. Soil is added to the vial when the pre-pupal stage is reached, and pupation occurs in the soil, which is kept moist until the adult emerges. When the maize sprouts are too large, the larvae sometimes drill into the stems and cannot be observed. The growth of fungi, which is another of the difficulties encountered, can be prevented by simple practices of cleanliness and aeration, which are discussed. Food-plants other than maize tested as larval food all proved unsatisfactory. Paper towels were found to be the most satisfactory medium for the maize to sprout in. A systematic method of recording the generations, of which three or more occurred each year with considerable overlapping, is briefly outlined.

Marcovitch (S.), Stanley (W. W.) & Anthony (M. V.). **A preliminary Report on arsenical Substitutes for Peach Spraying.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 844–850, 11 refs. Geneva, N.Y., August 1931.

In view of the increasing importance of insect pests of peach in Tennessee and of the sensitiveness of peach foliage to arsenical injury, a study was made of the newer insecticides such as cryolite, the physical and chemical properties of various types of which are analysed, and barium fluosilicate, and comparative tests were made with these materials and the standard lead arsenate. Sprays were applied at the rate of 1 lb. insecticide to 50 U.S. gals. Whereas severe defoliation resulted in one set of experiments from 4 applications of lead arsenate and considerable injury from 3, the fluorine compounds were found to be safe. The largest percentage of sound fruit (81·11) was recorded for a plot receiving a dust consisting of 50 per cent. barium fluosilicate and 50 per cent. sulphur. Ten per cent. dusts of cryolite and barium fluosilicate and 5 per cent. lead arsenate gave poor control. The plots sprayed with the fluorine compounds showed 77·6 per cent. sound fruit, as compared with 68 per cent. with lead arsenate and 5·8 per cent. in the unsprayed plots. There was little difference in the control of the curculio [*Conotrachelus nenuphar*, Hbst.] by the lead arsenate or fluorine sprays, but the latter showed more efficiency against the larvae of the Oriental fruit moth [*Cydia molesta*, Busck]. The experiments

indicate that dusting gives better control of *C. molesta*, and if a dust can be found that will also give good control of *C. nenuphar*, dusting of peaches will be preferable to spraying. The evidence also indicates that a fluorine residue on peaches will be very much less objectionable than arsenic.

Butler (H. G.). **Observations on the Biology of the Peach Borer in Roane County, Tennessee, Harriman, Tennessee, 1930.**— *J. Econ. Ent.*, xxiv, no. 4, pp. 851–854. Geneva, N.Y., August 1931.

In the course of an investigation carried out in eastern Tennessee in 1930, adults of *Aegeria exitiosa*, Say (peach borer) were observed to emerge from 20th June until 22nd September, maximum emergence occurring during the latter half of August. Insectary records showed the average number of eggs laid by one female to be 270. Adults lived 2–9 days in captivity. Dissections of 9 females showed the average potential oviposition to be in excess of 700 eggs. Oviposition began within 24 hours of emergence, the last eggs being laid in the insectary on 22nd September. A parasite observed on two occasions was *Microbracon sanninoideae*, Gahan. Although the work of predators (possibly mice) was quite evident and probably prevented the emergence of more than half the mature larvae in 1930, it is not considered to be of much importance in view of the relatively high efficiency of paradichlorobenzene in controlling *A. exitiosa*, and the possibility that it may only occur in the case of exceptionally heavy infestation.

Snapp (O. I.) & Thomson (J. R.). **Results of spraying and dusting Experiments for the Control of the Curculio attacking Peaches during the Season of 1930.**— *J. Econ. Ent.*, xxiv, no. 4, pp. 854–860. Geneva, N.Y., August 1931.

The following is largely taken from the authors' summary : Although previous experiments in Georgia [*R.A.E.*, A, xviii, 680] have shown that lead arsenate is more effective as a spray against curculio [*Conotrachelus nenuphar*, Hbst.] attacking peaches than as a dust at the usual dosage ($\frac{1}{5}$–$\frac{1}{4}$ lb. to each tree), experiments conducted in peach orchards in 1930 have shown that heavy applications of dust ($\frac{1}{3}$–$\frac{1}{2}$ lb. to each tree) containing 5 per cent. lead arsenate will control a moderate infestation as efficiently as sprays. Dust containing 5 per cent. lead arsenate gave as good control of curculio in the harvested fruit as one containing 10 per cent. Although fallen fruits from trees treated with the 10 per cent. dust contained less larvae than those from trees treated with the 5 per cent. one, the former cannot be used in dosages as heavy as those tested on account of severe budwood and foliage injury. The standard schedule of sprays gave as good control as that with fish-oil added to the sprays, or that with an extra application when the buds are pink. Lead arsenate used with carbon monosulphide and without lime gave more foliage injury than when used with self-boiled lime-sulphur containing the usual quantity of lime.

Eddy (C. O.) & Nettles (W. C.). **Biological Studies of the Oriental Fruit Moth.**— *J. Econ. Ent.*, xxiv, no. 4, p. 861 Geneva, N.Y., August 1931.

This paper, of which only an abstract is given, records life-history data in respect of *Cydia* (*Laspeyresia*) *molesta*, Busck, obtained in 1930

in South Carolina where it was destructive to late varieties of peaches. Two complete generations were produced ; adults of the third and fourth generations appeared, but some of the larvae of these and all those of the fifth went into hibernation. The first eggs were found on 24th April, and subsequent dates of development are believed to be much later than normal owing to the cold late spring. The first eggs that produced overwintering larvae were laid on 15th August, and the last eggs that produced adults were laid on 31st August. The last adult died on 21st October, two days after the hatching of the last eggs of the season and the first frost. Parasites found in South Carolina in 1930 included : *Ascogaster carpocapsae*, Vier., *Brachymeria* (?) *hammari*, Cwfd., *Cremastus tortricidis*, Cush., *Dibrachys cavus*, Wlk. (*boucheanus*, Ratz.), *Eupelmus cyaniceps* var. *amicus*, Gir., *E. limneriae*, How., *Goniozus columbianus*, Ashm., *Haltichella longicornis*, Ashm., *Macrocentrus ancylivora*, Roh. (introduced), *M. delicatus*, Cress., and *Microbracon mellitor*, Say.

Bissell (T. L.). **Experiments on controlling Larvae of the Pecan Weevil by cultural Methods.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 861–866. Geneva, N.Y., August 1931.

The larvae of *Curculio caryae*, Horn (pecan weevil) are most susceptible to control during the short period intervening between their emergence from the nut and their entry into the soil. Records of dates of emergence from pecan nuts in Georgia for the years 1928, 1929 and 1930 show that mean emergence dates precede the earliest harvest dates of the nuts by 8–10 days, so that about 70 per cent. of the emerging larvae have left the nuts before they are harvested. As premature harvesting is very laborious and tends to reduce the quality of the nuts, it is advisable to prevent the larvae from entering the soil before the nuts are gathered. Experiments carried out in 1930, which are described in detail, indicated that they can be prevented from penetrating the soil by hand raking and rolling and to a less degree by raking alone just before they emerge from the nuts. In three types of experimental plots, 14 per cent. of the larvae burrowed in raked and rolled ground, 70·8 per cent. in raked ground and 86·6 per cent. in untreated ground. On each plot more larvae burrowed where the ground was shaded. Of 836 larvae that succeeded in entering the soil in the whole series of experiments, 83·5 per cent. were hidden within 2 hours, and of 277 more closely observed, 61·8 per cent. penetrated within the first 30 minutes after being placed on the ground. Of these, 16 per cent. on the rolled ground, 59 per cent. on the raked ground and 79 per cent. on the untreated ground penetrated within the first half hour.

Ingram (J. W.). **Soil Animals attacking Sugar Cane.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 866–869, 4 refs. Geneva, N.Y., August 1931.

A soil survey made to obtain further information concerning the part played by soil animals in root deterioration of sugar-cane in Louisiana [*R.A.E.*, A, xviii, 168, 678] showed that the number of soil animals and the amount of injury were greatest in heavy soils. Plant cane suffered more root injury than stubble cane. Of the species found to be injurious, the most numerous, the Symphilid, *Hanseniella unguiculata*, Bagnall, was decidedly more abundant in stubble than in

plant cane and showed a preference for heavy soils ; *Lepidocyrtus violentus*, Fols., was most numerous on plant cane and about equally numerous on heavy and light soils ; *Japyx* sp., here recorded for the first time as injurious to sugar-cane in Louisiana, was most numerous in stubble but showed little preference for the different types of soil ; and *Onychiurus armatus*, Tull., showed a preference for plant cane and the heavier types of soil. Little correlation was found between the alkalinity or acidity of the soil and the number of soil animals present.

By taking samples of soil in fields of soy-beans and maize grown in rotation with sugar-cane, it was found that in heavy soils the population was greater than in sugar-cane fields on the same type of soil. The Symphilids were more numerous in sugar-cane fields, whereas the Collembola predominated in maize and soy-bean fields, and were found to thrive better in poorly-drained soils than did the Symphilids.

To determine the food-preferences of different soil animals various species were released in jars of sterile soil and possible foods were added. When released in sterile soil only, all species decreased in numbers, and all survived on newly-cut cane stalks. *H. unguiculata* did not live when fed wholly on sugar-cane roots. *L. violentus* was the only form that multiplied on the materials added, the most rapid increase occurring on soaked maize and parched peanuts. An investigation of the soil in cane fields following flooded rice, carried out to determine the length of time required for soil animals to regain their normal numbers following almost complete extermination, showed that the benefit derived from destroying them would last only till the next year, the population being normal in the second year.

Osterberger (B. A.). **The Importance of** *Euetheola* (*Ligyrus*) *rugiceps* **Lec., an Enemy of Sugarcane.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 870–872, 5 refs. Geneva, N.Y., August 1931.

Euetheola (*Ligyrus*) *rugiceps*, Lec., has been known as a pest of sugar-cane in central Louisiana for over 50 years, although considered to be of only slight economic importance. Recent investigations have shown that this beetle is distributed throughout the State, although the most serious damage is still local. Injury is caused by the over-wintering adults, which emerge about the first week in March and attack the original mother stalks of sugar-cane just below the ground, often completely cutting off the sap supply and eventually causing the formation of a dead heart. Although young plant cane suffers most severely, young stubble cane and even mature cane are sometimes attacked. The beetle is also injurious to maize and rice. Experimental work carried out at Franklin, Louisiana, in 1930 shows that the destruction of the original mother stalk only in each stool would result in a decrease in yield of about 25 per cent., and a loss in sugar production of £7 an acre.

Dietrich (H.). **Synonymy and Notes on the** *Pissodes* **Weevil attacking** *Cedrus deodara*.—*J. Econ. Ent.*, xxiv, no. 4, pp. 872–874, 2 refs. Geneva, N.Y., August 1931.

Observations show that the weevil causing serious injury to *Cedrus deodara* in southern Mississippi, originally described as *Pissodes deodarae*, Hopk., is identical with *P. nemorensis*, Germ. This weevil has been found breeding in three imported cedars, *C. deodara*, *C.*

atlantica and *C. libani*, as well as in all the pines native to southern Mississippi, but no injury typical of it has ever been noticed in any of the many other conifers commonly grown in the south. It has only one generation a year. The larvae pupate in March, and the adults emerge in April, but immediately disappear, presumably aestivating in the ground litter. They reappear in late autumn and are present throughout the entire winter, when mating and oviposition occur. They were observed on *C. deodara*, making punctures through the bark and eating out considerable areas, sometimes girdling the branch. Eggs are sometimes laid in the smaller holes. Leaders begin to die about the middle of January, and when cut into, reveal eggs and larvae of all stages. The larvae bore in the cambium layer, and their galleries can be traced by the swelling of the bark. Although *P. nemorensis* oviposits in perfectly healthy cedars, weakened trees are most subject to attack, and are usually killed. Every size of tree is attacked. Native pines are only attacked when dead or greatly weakened, and then only on the trunk, larger limbs or roots. Repellents such as liquid lime-sulphur, 1 : 4, or Bordeaux mixture were not effective in keeping off the weevils from *C. deodara*, though the materials did not injure the tree.

Illingworth (J. F.). **Preliminary Report on Evidence that Mealy Bugs are an important Factor in Pineapple Wilt.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 877–889, 1 pl., 1 ref. Geneva, N.Y., August 1931.

Data bearing upon the relation between ants and mealybugs and pineapple wilt disease, obtained over a period of 4 years in Hawaii, show that *Pseudococcus brevipes*, Ckll., after feeding on plants suffering from wilt, transmits the disease to healthy plants. In the field the mealybugs leave the wilted plants as soon as the leaves become dry and crawl to adjoining healthy ones. The symptoms of the disease are described in detail, and its economic importance is discussed, the annual loss to the pineapple industry in Hawaii being estimated at over £250,000. An account is given of a series of experiments, the results of which indicate that, although the disease is definitely not carried by ants, *P. brevipes* gradually disappears on plants kept free from *Pheidole megacephala*, F., whereas it becomes very prolific where the ants have free access to the plants. The ants protect the mealybugs from their natural enemies, which would otherwise hold them in check, and aid in their distribution. These experiments further indicate that wilt-infected mealybugs survive from one crop of pineapple to the next on old, discarded stumps, although the new generation on these stumps may lose some of its virulence. It appears that the disease first attacks the leaves and gradually spreads to the roots of the pineapple plant, resulting in its collapse. The progress of the disease is somewhat slow, a period of three months after the initial infection being required for it to make itself evident in the yellowing of the outer leaves. *P. brevipes* may be most effectively controlled by cultural measures, the most important of which are a thorough preparation of the field, including the elimination of stumps and grass roots on which mealybugs might survive, the selection of plants free from spotting, and the maintenance of clean culture along the borders of the fields where stumps and rubbish are liable to accumulate. Attempts to devise barriers against the mealybugs have not proved successful owing to the ease with which they are able to travel.

Laboratory observations indicate that the young forms can travel 10 ft. in an hour, and they move readily over foliage coated with oils used to exclude ants. Mealybugs in the leaf axils can be destroyed by filling the heart of the plant with oil emulsion, but no practical method is known for controlling them when they occur on the stem and roots under the soil. Other measures suggested are the control of the ants by means of poison baits, and the introduction of natural enemies of *P. brevipes*, particularly parasites.

Poos (F. W.) & Haenseler (C. M.). **Injury to Varieties of Eggplant by the Potato Leafhopper,** *Empoasca fabae* **(Harris).**—*J. Econ. Ent.*, xxiv, no. 4, pp. 890–892, 2 pls., 2 refs. Geneva, N.Y., August 1931.

Tests under cage conditions proved that *Empoasca fabae*, Harr., causes serious injury to certain varieties of egg-plant, the symptoms coinciding with those described as occurring under field conditions in New Jersey. The susceptibility of the individual varieties is discussed.

Sweetman (H. L.) & Wedemeyer (J.). **Notes on the Life History of** *Chaitophorus populella* **G. & P. (Aphididae, Homoptera).**—*J. Econ. Ent.*, xxiv, no. 4, pp. 893–896, 1 map, 1 ref. Geneva, N.Y., August 1931.

Chaitophorus populella, Gillette & Palmer, which was described from Colorado in 1928, was extremely abundant at Laramie, Wyoming, on *Populus* spp. and *Salix* spp. during 1927–1930 inclusive, but was not found on *P. tremuloides*, a species very common in the mountains about 10 miles distant on the windward side. The fact that *C. populella* is found both west and east of the Rocky Mountains indicates a wider distribution than that at present known. The altitude of the three localities from which it has been recorded ranges between 5,000 and 7,300 ft. After the Aphids became numerous at Laramie, the ground and vegetation beneath the trees were coated with honeydew. The winter eggs, which are described, are laid in crevices of the rough bark of the trees. Several attempts made to hatch the eggs in winter under various temperature and moisture conditions were all unsuccessful. In 1930, eggs were collected at frequent intervals from 1st May onwards. The first eggs hatched on 18th May both in the field and in the laboratory, and the large majority hatched in the following 4 days. Newly hatched nymphs remained near the place of emergence for about a week before migrating to the leaves, feeding upon the sap of the trees in the crevices about wounds on the trunk. Hatching coincided with the splitting of the first leaf-buds, and migration of the nymphs followed shortly after full expansion of the new leaves. Soon after the stem-mothers settled on the leaves, the second generation nymphs appeared, followed at the end of June or in early July by the appearance of alate forms. These migrants scattered to various species of *Populus* and *Salix*, apparently not being attracted to a secondary food-plant, and could be found during the remainder of the summer on previously infested as well as newly infested trees. The migrants were apparently all viviparous. During August and September apterous males and females, as well as alate females, were present on the same trees.

Bailey (S. F.). **The Use of transparent Cellulose Films in Life History Studies.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 898–901. Geneva, N.Y., August 1931.

The following is taken from the author's abstract: Cellophane, a transparent cellulose film of a permeable nature, appears to be very adaptable to the life-history study of insects on their food-plants. The chief disadvantage in its use out-of-doors is that, when wet, cellophane becomes flabby and upon drying out has a tendency to crack. Some tests were made to determine the actual conditions of temperature within cellophane cages. The results show that outside conditions with their hourly fluctuations are rather closely approximated within the cages, much more so in the case of temperature, which is uniformly slightly higher in the cages than outside, than in that of humidity.

Turner (N.). **Standardised Oil Sprays.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 901–904, 12 refs. Geneva, N.Y., August 1931.

With a view to facilitating the standardisation of procedure and correlation of results, the question of specifications for oil sprays is discussed from the literature, and it is suggested that viscosity, volatility and unsulphonatable residue determinations be published in all papers giving the results of tests. It is further suggested that Saybolt viscosity at 100° F. be used rather than the variable terms light, medium, etc., and the following method for measuring volatility of spray oils is quoted: one gm. of the oil is placed in a 10 cm. flat-bottomed aluminium dish containing 9 gm. of 20–40 mesh sand, and the dish heated over an 8 cm. hole on the top of a boiling water bath. Weighings are made up to and including 24 hours and the loss calculated. In making this test it is essential that these conditions be strictly adhered to, otherwise variable results will be obtained. The kind and amount of the emulsifier and the method of emulsification should also be stated. These suggestions apply particularly to materials used in laboratory preparations, but when proprietary sprays are used the same information is equally important. Where this is not available, the exact name of the material and the date of purchase should be given.

Smith (F. F.). **A new Type of Insect Cage.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 914–916, 1 pl., 2 refs. Geneva, N.Y., August 1931.

A description is given of a method of constructing a micro-cage designed for confining leafhoppers, etc., to small areas on leaves or stems of plants and having certain advantages over other previously described cages.

Papers noticed by Title only.

Shull (A. F.). **Order of embryonic Segregation in intermediate Aphids not reversed by low Temperature.**—*Amer. Nat.*, lxv, no. 700, pp. 469–473, 5 refs. New York, N.Y., 1931.

Balachowsky (A.). **Contribution à l'étude des Coccides de l'Afrique mineure (10e note). Sur un nouveau *Lichtensia* du Maroc septentrional** [*Lichtensia rifana*, sp. n.].—*Bull. Soc. Sci. nat. Maroc*, x, no. 7–9, pp. 215–216, 1 pl. Rabat, 1931.

Dozier (H. L.). **A new Giant Wax Scale** [*Ceroplastes giganteus*, sp. n.] **from Haiti.**—*Amer. Mus. Nov.*, no. 495, 2 pp., 1 fig. New York, September 1931.

Pussard-Radulesco (E.). **Recherches biologiques et cytologiques sur quelques Thysanoptères.**—*Ann. Epiphyties*, xvi (1930), no. 3–4, pp. 103–189, 2 pls., 27 figs., 8 pp. refs. Paris, 30th April 1931.

Dietrich (H.). **Mounting Coleoptera.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 874–877. Geneva, N.Y., August 1931.

de la Escalera (M. M.). **Una nueva especie de** *Anthaxia* [*ceballosi*, sp. n., from Spain] (**Col. Buprest.**) **que vive en el** *Abies pinsapo.*—*Bol. Soc. españ. Hist. nat.*, xxxi, no. 6, pp. 433–436, 1 fig. Madrid, June 1931.

Eggers (H.). **Borkenkäfer (Ipidae, Col.) aus Südamerika. iv.** [Fifteen new Scolytids from Brazil and Bolivia.]—*Wien. ent. Ztg.*, xlviii, no. 1, pp. 29–42. Vienna, 30th June 1931.

Schedl (K.). **Notes on the Pityophthorinae** (**Coleoptera Ipidae**) **II. Three new Species** [of the genus *Pityophthorus* from Canada].—*Canad. Ent.*, lxiii, no. 7, pp. 163–168. Orillia, Ont., July 1931.

Blunck (H.) & Kaufmann (O.). **Die Rübenfliege und ihre Bekämpfung.** [The Beet-fly, *Pegomyia hyoscyami*, Panz., and its Control in Germany.]—*Flugbl. Biol. Reichsanst. Land- u. Forstw.*, no. 117, 4 pp., 1 fig. Berlin, June 1931. [*Cf. R.A.E.*, A, xvii, 250, 599.]

Zwölfer (W.). **Küçük Asya mizir haşare mecmuasinin taninmasi üzerine etüt I. Sune haşeresinin Epidemiologisinin tetkikati** *Eurygaster integriceps* **Put.** (**Hemipt. Het.**). [Contributions to a Knowledge of the Pests of Asia Minor, I. Investigations on the Epidemiology of *E. integriceps.*]—27 pp., 11 figs. Stamboul, Ahmet Ihsan Matbaasi Ltd., 1931. [Translation in Turkish by Mithat Ali of paper already noticed, *R.A.E.*, A, xix, 300.]

Oppi (E.). **Istruzioni pratiche per la lotta contro le grillotalpe.** [Practical Instructions for the Control of *Gryllotalpa gryllotalpa*, L., by Means of a Bait of broken Rice and Zinc Phosphide.]—4 pp., 1 fig. Verona, R. Osserv. fitopat. Veneto e Venezia tridentina, 30th April 1931. [*Cf. R.A.E.*, A, xviii, 45, 335, etc.]

Nelsen (O. E.). **Life cycle, Sex Differentiation, and Testis Development in** *Melanoplus differentialis* (**Acrididae, Orthoptera**).—*J. Morph.*, li, no. 2, pp. 467–526, 5 pls., 2 figs., 46 refs. Philadelphia, Pa., 5th June 1931.

Back (E. A.). **Conserving Corn from Weevils in the Gulf Coast States.**—*Fmrs'. Bull. U.S. Dept. Agric.*, no. 1029 revd., 30 pp., 20 figs. Washington, D.C., May 1931. [*Cf. R.A.E.*, A, vii, 409.]

Knowlton (G. F.) & Janes (M. J.). **Notes on Insect Food of two Utah Lizards.**—*Proc. Utah Acad. Sci.*, viii, pp. 140–142. Salt Lake City, 1931.

Schmidt (H. W.). **Biologischer Kampf gegen** *Panolis piniperda*-**Befall. Spinnen als Hilfskräfte.** [Biological Control of Infestation by *P. flammea*, Schiff. Spiders as Auxiliaries (including records of several species near Nürnberg).]—*Allg. Forst- u. Jagdztg.*, cvi, pp. 404–408. Frankfurt a. M., 1930. (Abstract in *Zbl. Bakt.*, (2) lxxxiv, no. 8–14, pp. 347–348. Jena, July 1931.)

[Bilanovs'kiĭ (I. D.).] Belanovskij (J. D.). **Біланoвський (І. Д.). Beiträge zur Tachinenfauna des Gouvernements Kyjiw.** [Contribution to the Tachinid Fauna of the Government of Kiev. Review of the species of 117 genera, including some notes on their classification, and descriptions of 1 new genus, 3 new species and 1 new subspecies.]—*Mém. Cl. Sci. nat. techn. Acad. Sci. Ukraine*, no. 5, pp. 17–42, 2 figs., 36 refs. Kiev, 1931.

Jaynes (H. A.). **Apuntes sobre** *Paratheresia claripalpis*, **Van der Wulp, un parásito de** *Diatraea saccharalis*, **Fabr.** [Notes on *P. claripalpis*, a Parasite of *D. saccharalis*.]—*Rev. ind. agríc. Tucumán*, xxi, no. 3–4, pp. 63–66, 4 refs. Tucumán, 1931. [See *R.A.E.*, A, xviii, 677.]

Mercet (R. G.). **Le genre** *Encarsia* **et description d'***Encarsia indifferentis* **nov. sp. d'Egypte. (Hymen.-Chalc.: Aphelinidae).** [A French translation of extracts relating to Egyptian species from papers in Spanish (*R.A.E.*, A, xviii, 39, 568).]—*Bull. Soc. R. ent. Egypte*, 1930, fasc. 4, pp. 220–223, 2 figs. Cairo, 1931.

Mercet (R. G.). **Les genres** *Prochiloneurus* **et** *Achrysopophagus* **(Hymen.-Chalcididae).** [French translation of paper in Spanish, *R.A.E.*, A, xviii, 327].—*Bull. Soc. R. ent. Egypte*, 1930, fasc. 4, pp. 224–228, 2 figs. Cairo, 1931.

Saling (T.) & Kemper (H.). **Ueber die Wirkung des T-Gases (Aetox) auf verschiedene Warmblüter und Gliederfüssler, insbesondere über seine Eignung zur Vertilgung von Gesundheits- und Vorratsschädlingen.** [On the Effect of T-Gas (a mixture of ethylene oxide and carbon dioxide) on various warm-blooded Animals and Arthropods, especially on its Application for the Control of Household and Stored Product Pests.]—*Z. Desinfekt.*, xxiii, no. 7, pp. 285–314. Dresden, July 1931. [For briefer account see *R.A.E.*, A, xix, 461.]

Roark (R. C.). **Review of United States Patents relating to Pest Control** [issued January–June 1931].—iv, nos. 1–6; 13, 12, 11, 14, 11, 10 pp. multigraph. Washington, D.C., U.S. Dept. Agric., Bur. Chemistry & Soils, 1931.

Publications of the Insecticide Division. A complete List from July 1, 1927 to June 30, 1931.—9 pp., multigraph. Washington, D.C., U.S. Dept. Agric., Bur. Chemistry & Soils, 1931.

Roark (R. C.). **Recent Progress in Mothproofing** [Review of recent literature and patents in various countries].—*Textile Colorist*, liii, no. 629, reprint 5 pp. Philadelphia, Pa., May 1931.

Gersdorff (W. A.). **A Study of the Toxicity of Toxicarol, Deguelin and Tephrosin using the Goldfish as the Test Animal.**—*J. Amer. Chem. Soc.*, liii, pp. 1897–1901, 6 refs. Easton, Pa., 1931.

Clark (E. P.). **2, 4, 5-Trimethoxybenzoic Acid: a Derivative of Dehydrodeguelin.**—*T.c.*, pp. 2007–2008, 5 refs. [*Cf. R.A.E.*, A, xix, 308.]

Clark (E. P.). **Toxicarol. II. Some Acetyl Derivatives of Toxicarol.**—*T.c.*, pp. 2264–2271, 2 refs. [*Cf. R.A.E.*, A, xviii, 690.]

Haller (H. L.) & LaForge (F B.). **Rotenone. XII. Some new Derivatives of Rotenol.**—*T.c.*, pp. 2271–2275, 4 refs. [*Cf. R.A.E.*, A, xix, 312.]

Clark (E. P.). **Deguelin. II. Relationships between Deguelin and Rotenone.**—*T.c.*, pp. 2369–2373, 8 refs. [*Cf. R.A.E.*, A, xix, 308.]

Shepard (H. H.) & Richardson (C. H.). **A Method of determining the relative Toxicity of Contact Insecticides, with especial Reference to the Action of Nicotine against** *Aphis rumicis*.—*J. Econ. Ent.*, xxiv, no. 4, pp. 905–914, 3 graphs, 9 refs. Geneva, N.Y., August 1931.

Methods hitherto employed for determining the relative toxicity of contact insecticides are discussed, and the disadvantages connected with their use are pointed out. Nicotine and nicotine sulphate have been used against *Aphis rumicis*, L., to develop a method that has been devised as a substitute for the usual spray tests in cases where greater precision is desirable, and to serve as standards of comparison of the toxicity of other compounds. The nicotine sulphate solutions were made by titrating nicotine base with 0·1 N sulphuric acid in the presence of methyl red, the end-point in this case being very close to pH 5·0. Groups of wingless adult females of *A. rumicis* were placed in medium-sized test tubes plugged with cotton and held in a constant temperature chamber at 26° C. [78·8° F.], to which the nicotine solutions were also brought. Each test-tube was then filled half full or more with the solution and the insects kept below the surface with a piece of cotton or cheesecloth. Aphids immersed according to this method in distilled water for an hour remain unaffected and 60 per cent. recovered after immersion for 3 hours, so that actual drowning from immersion in insecticide solutions for up to 1–2 hours is somewhat slight.

Toxicity curves have been determined in two ways for each compound, one in which concentration is variable and time of immersion constant, and the other in which time of immersion is variable and concentration constant. Two sets of determinations are given for the second curve, from counts of percentage of kill at 3 hours from treatment and at 24 hours. The nicotine base acts more rapidly than does the sulphate, and the results obtained in this study show a relation between the toxicity of the two in connection with Aphids similar to that previously found in connection with mosquito larvae [*R.A.E.*, B, xix, 29].

Swingle (H. S.) & Seal (J. L.). **Some fungous and bacterial Diseases of Pecan Weevil Larvae.**—*J. Econ. Ent.*, xxiv, no. 4, p. 917. Geneva, N.Y., August 1931.

Preliminary tests under controlled conditions with *Metarrhizium anisopliae* and *Beauveria* (*Sporotrichum*) *bassiana*, the most important of several organisms isolated from diseased larvae of *Curculio caryae*, Horn (pecan weevil) that had entered the soil, gave a mortality of 75–100 per cent. of the larvae. *M. anisopliae* has also been found to be parasitic on the larvae of *Cotinis nitida*, L., and *B. bassiana* on those of *Diatraea zeacolella*, Dyar. More extensive field tests are in progress to determine the effectiveness of these diseases as a control measure for *Curculio caryae*.

Felt (E. P.). **The Maple Bladder Gall,** *Phyllocoptes quadripes* **Shim.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 917–918. Geneva, N.Y., August 1931.

A general infestation involving economic damage by *Phyllocoptes quadripes*, Shim., which is common on soft maple though not ordinarily injurious, was recorded in June from Lenox, Massachusetts. The

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infested soft maples had a trunk diameter of 9–10 ins., and two were so badly attacked that few normally functioning leaves remained, most of the others being covered with masses of galls. Earlier work has shown that *P. quadripes* can be controlled by dormant applications of a lime-sulphur spray.

HAMILTON, jr. (W. J.). **Skunks as Grasshopper Destroyers.**—*J. Econ. Ent.*, xxiv, no. 4, p. 918. Geneva, N.Y., August 1931.

Examination of the stomach contents of 230 skunks showed 43 per cent. of the animals to contain the remains of *Melanoplus femur-rubrum*, DeG., these constituting 15–100 per cent. of the bulk of the contents. All specimens examined came from Ithaca, New York, and the majority were trapped between 10th November and 15th February. The grasshoppers taken in the winter months were probably picked from the grass where an early frost had killed them, or possibly dug from the ground where they pass the winter in the dormant stage. It is not improbable that many more are eaten in late summer.

RICHARDSON (C. H.). **Demonstration of the practical Value of Cold-mixed Petroleum Oil Emulsion.**—*J. Econ. Ent.*, xxiv, no. 4, pp. 918–919, 2 refs. Geneva, N.Y., August 1931.

Experience with a cold-mixed oil emulsion made with potash fish-oil soap by a method already noticed [*R.A.E.*, A, xiv, 454] and containing about 89 per cent. oil by volume shows that the resulting paste is very stable and may be stored almost indefinitely in air-tight containers. Reference is made to more recent work by Siegler and Brown with cold-mixed emulsions made with resin fish-oil soap, which shows that these preparations are very resistant to the breaking action of hard water often encountered in limestone regions. Ordinary potash fish-oil soap is more satisfactory in regions where water is soft. More extensive use of this method of making emulsions, which has been employed for a number of years in certain commercial apple orchards in Maryland and Virginia, and is rapid, economical and requires simple equipment, is recommended.

VAN LEEUWEN (E. R.) & VAN DER MEULEN (P. A.). **Experiments with Japanese Beetle Traps.**—*J. Econ. Ent.*, xxiv, no. 4, p. 919. Geneva, N.Y., August 1931.

Comparative tests indicate that white painted traps are definitely more effective in catching the Japanese beetle [*Popillia japonica*, Newm.] than those painted green [*cf. R.A.E.*, A, xvii, 421 ; xviii, 644]. A difference of 39·9 per cent. in favour of green traps with white baffles was observed in an experiment carried out from 11th July till 11th August, as against traps painted entirely green, and in a second experiment, carried out from 23rd July until 11th August, a gain of 110·3 per cent. was shown in favour of all-white as compared with all-green traps. A further experiment with a much larger series of traps with eleven possible combinations of variations of white and green parts, though incomplete, gave results confirming those of the earlier trials. Although no explanation is definitely apparent, it is suggested that the whiteness prevents the formation of shadows and makes for a lighter entrance.

Delassus (M.). **Algeria : Information on the last anti-locust Campaign.** —*Int. Rev. Agric.*, xxii, no. 6, pp. M89–M94. Rome, June 1931.

A poison-bait consisting of 4–5 lb. sodium arsenate, 10 lb. molasses and 100–120 lb. bran was found to be the best means of destroying the hoppers of *Schistocerca gregaria*, Forsk., and was successfully used when they were only 3 or 4 days old. Some experiments were made with sodium fluosilicate, a 4 per cent. solution of which was found to be effective as a contact insecticide or as a stomach poison. Its price compares favourably with that of sodium arsenate, but further experiments are necessary before it can be universally adopted.

A new flame-thrower, a description of which is given, has been tried with a certain amount of success. Although cheaper than the apparatus previously employed, it is more expensive to use than poison bait, which alone can achieve complete destruction.

Apart from the usual vertebrate enemies of the adults and hoppers, the egg-clusters were sought for by numerous birds, especially larks, the presence of which in large numbers was a definite indication of that of egg-deposits. The adult locusts were attacked by the flies, *Sarcophila latifrons*, Fall., which almost completely destroyed the first swarms in one locality, *Disjunctio* (*Wohlfahrtia*) *bella*, Macq., and *Phaonia trimaculata*, Bch. The eggs were destroyed by the fungus, *Oospora ovorum*, which was very prevalent in compact humid soils, and by larvae of *Phorbia* (*Chortophila*) *cilicrura*, Rond., and *Stomatorrhina lunata*, F. The latter was widely distributed, and in one locality destroyed 90–95 per cent. of the eggs.

Schouteden (H.). **Les sauterelles migratrices.**—*Bull. Cercle zool. congol.*, viii, pp. [11]–[34], 7 figs., in *Rev. Zool. Bot. afr.*, xxi, fasc. 1. Brussels, 1st October 1931.

Three species of locusts took part in the recent invasion of the Belgian Congo. *Nomadacris septemfasciata*, Serv., appeared in eastern Katanga, near lake Mweru, in large swarms, which originated in Rhodesia and spread into the neighbouring territories (Kiambi, Kilwa, etc.), where eggs were laid. This species has also been recorded from Kina. *Locusta migratoria migratorioides*, R. & F., invaded the whole northern part of the Belgian Congo, having probably come from the lake Chad area. The occupied territory in Ruanda-Urundi was also invaded, probably from East Africa. An enormous swarm of *Schistocerca gregaria*, Forsk., appeared in February 1930 in the Uelé region, having come from French Equatorial Africa. The three species differ in their feeding habits. *L. migratoria migratorioides* and *N. septemfasciata* prefer graminaceous plants, but the latter also attacks cassava [*Manihot utilissima*]. *S. gregaria* attacks cereals, *Moringa*, *Albizzia*, cassava, papaya [*Carica papaya*], *Borassus*, etc.

Descriptions are given of these three locusts and of *Anacridium moestum*, Serv., with a key and notes on their bionomics ; and an appeal is made for information on locusts based on the questionnaire published by the Imperial Institute of Entomology, a French version of which is appended. Among the control measures applied in the Belgian Congo, trenching was found to be very effective.

Trochain (J.). **Les déprédations des Sauterelles au Sénégal.**—*Rev. Bot. appl. Agr. trop.*, xi, no. 119, pp. 553–557, 2 figs. Paris, July 1931.

In November-December 1930 swarms of immature *Schistocerca gregaria*, Forsk., were observed in Senegal damaging a variety of plants, including cassava [*Manihot utilissima*], cereals and beans, but *Acacia arabica*, castor-oil plants [*Ricinus communis*] and tobacco seedlings were not attacked. In January 1931 a mixed swarm of *Locusta migratoria migratorioides*, R. & F., and *S. gregaria* was observed on the shores of the Casamance river, damaging papaya [*Carica papaya*], banana and tomato.

Ghesquière (J.). **Sur l'importance économique et la biologie de deux Pyraustines nouvelles pour le Congo belge,** *Leucinodes orbonalis* **Guen. et** *Pimelephila ghesquierei* **Tams.**—*Bull. Ann. Soc. ent. Belg.*, lxxi, no. 6–8, pp. 131–138, 23 refs. Brussels, 10th September 1931.

The Pyralids, *Leucinodes orbonalis*, Guen., and *Pimelephila ghesquierei*, Tams [*R.A.E.*, A, xviii, 426] have only recently been recorded in the Belgian Congo. The adult and larva of each species is briefly described. *L. orbonalis*, the distribution of which is reviewed from the literature, is generally considered a serious pest, the larva living on wild and cultivated solanaceous plants. In the Belgian Congo, it has only been recorded on potatoes grown from seed obtained from the eastern part of the colony, oviposition occurring on the young leaves and terminal buds. The larva, immediately after hatching, enters the lamina of the leaf and feeds on the parenchyma, leaving the leaf as it dries up or decays for the leaf stalk ; this in turn withers so that in time the whole plant dies. Pupation occurs in dried leaves or in the ground in a silken cocoon. No parasities have been obtained in the Belgian Congo, though the Ichneumonid, *Pristomerus testaceus*, Morl., has been recorded from south India as a parasite of both this species and *Euzophera perticella*, Rag.

Pimelephila ghesquierei is specific to *Elaeis* [*guineënsis*] and is found in the Belgian Congo wherever its food-plant occurs. Oil palms grown under heavy shade are always more liable to infestation, and one larva under these conditions is sometimes sufficient to cause the death of a young palm. Generally two or three are found in the central bunch of leaves of trees that are three or four years old, and if the galleries do not penetrate too far in the terminal shoot, the injury is comparatively slight. When, however, the attack reaches the heart of the palm, decay and secondary parasites invade the whole stem, causing ultimate death. The palm then has the appearance of being infested by *Oryctes*, for the centre leaves wither, while the outer ones remain green. The larva pupates in a cocoon of fibrous débris, generally at the base of the older leaves. The openings to the galleries are usually marked by a copious exudation of gum, which solidifies and dries, forming a protection against such wound-infesting weevils as *Temnoschoita*, *Calandra* (*Sitophilus*), etc. The extent of the damage caused is very uneven.

Light traps are quite ineffective against either of these moths ; hand collection is recommended, and in the case of *Pimelephila*, the burning of badly infested palms.

Dupont (P. R.). **Entomological and Mycological Notes.**—*Ann. Rep. Dept. Agric. Seychelles 1930*, pp. 11–13. Victoria, Seychelles, 1931.

In Seychelles, the Coccinellids, *Rodolia chermesina*, Muls., *Scymnus* (*Nephus*) *oblongosignatus*, Muls., and *S. constrictus* var. *intercisus*, Sic., were found on *Tephrosia candida* attacked by *Icerya seychellarum*, Westw., and on pigeon pea (*Cajanus indicus*) infested with *Aulacaspis* (*Diaspis*) *pentagona*, Targ. *R. chermesina* occurs on a large number of the food-plants of *I. seychellarum* but is not sufficiently abundant to control the latter, which is rapidly spreading, but does not occur on coconut [*cf. R.A.E.*, A, vi, 375]. The activities of this Coccinellid are probably checked by the common mynah bird (*Acridotheres tristis*), which feeds upon it, and by the ant, *Technomyrmex albipes*, Smith, which fosters *I. seychellarum*. The fungus [*Pseudomicrocera henningsii*], which attacks *Aspidiotus destructor*, Sign., in Sierra Leone and was introduced into Seychelles in 1929 [xix, 24], has failed to develop. During the same year, however, this fungus and its mature form, *Nectria diploa*, were discovered to occur naturally in several localities. It is not very effective and was only found infesting *Ischnaspis longirostris*, Sign. (*filiformis*, Dougl.) in four localities.

Of the two most important Coccids attacking coconut in Seychelles, *I. longirostris* occurs in Ceylon but is not there attacked by any predator or parasite. *Pinnaspis buxi*, Bch., is not found in Ceylon, but two allied scales, *P. minor*, Mask., and *P. aspidistrae*, Sign., infest palms and other trees both there and in Seychelles. In Ceylon *P. minor* is attacked by the parasites, *Aphelinus diaspidis*, How., *Prospaltella aurantii*, How., and *P. berlesei*, How., and the Coccinellid, *Chilocorus circumdatus*, Shön., which also preys upon *P. aspidistrae*, *Aulacaspis major*, Ckll. (*flacourtiae*, Rthf.), and *Aspidiotus lataniae*, Sign., all of which are pests in Seychelles. The introduction of these natural enemies is contemplated. Apart from the question of biological control, the improvement of the condition of the soil in coconut plantations by cultivation and manuring is recommended. A list is given of food-plants of *I. longirostris*, which include coffee, palms, cinnamon growing under coconut shade, guava, mango and *Anona*. *P. buxi*, which was first found on *Pandanus* in 1920, is widely distributed throughout the country, its other food-plants being only palms and *Calathea*. Both this Coccid and a number of others, a list of which is given, have lost their importance as coconut pests owing to the activities of their natural enemies, although *P. buxi* is still exceedingly abundant on poor soils in the northern part of Mahé.

Borgmeier (T.). **Eine neue zoophage Itonididengattung aus S. Paulo (Diptera, Itonididae).** [A new zoophagous Genus of Cecidomyiids from S. Paulo.]—*Rev. Ent.*, i, no. 2, pp. 184–191, 10 figs., 4 refs. S. Paulo, 15th July 1931.

Descriptions are given of the larva, pupa and adults of both sexes of the Cecidomyiid, *Olesicoccus costa-limai*, gen. et sp. n., from S. Paulo, Brazil, where the larvae were observed sucking the eggs of *Pulvinaria ficus*, Hemp., severely infesting the shrub, *Muehlenbeckia platyclada*. The plant was completely cleared of the Coccid in a couple of months. This Cecidomyiid has also been found attacking *P. eugeniae*, Hemp., on *Eugenia jambos*.

DA FONSECA (J. P.) & AUTUORI (M.). **Contribuição para a biologia de** *Solanophila clandestina* **(Muls.) (Col., Coccinell.).** [A Contribution to the Biology of *Epilachna clandestina*.]—*Rev. Ent.*, i, no. 2, pp. 219–224, 5 figs. S. Paulo, 15th July 1931.

The Coccinellid, *Epilachna* (*Solanophila*) *clandestina*, Muls., is a pest of *Sechium edule* and other cucurbits in Brazil. The eggs are laid on the plant and hatch in 11 days. The larvae and adults feed exclusively on the leaves, which they skeletonise.

CHIAROMONTE (A.). **La** *Diparopsis castanea*, **Hmps., sul Cotone a Barentù.** [*D. castanea* on Cotton at Barentù.]—*Agric. colon.*, xxv, no. 7–8, pp. 343–348, 3 figs. Florence, 1931.

Diparopsis castanea, Hmps., is recorded on cotton bolls in Eritrea, though it is rare and not important there. Descriptions of all stages and notes on its biology and the injury done by it are given. The ploughing under of all débris after the cotton harvest is considered the best method of control.

RAHMAN (K. A.). **Flame-throwers in Locust** (*Schistocerca gregaria*, **Forsk.**) **Control.**—*Agric. & Livestock in India*, i, pt. 4, pp. 382–395, 1 fig., 7 refs. Calcutta, July 1931.

Extensive tests were made in the Punjab in the spring of 1930 of the value of a flame-thrower devised by Bodkin [*R.A.E.*, A, xvii, 653] in the control of *Schistocerca gregaria*, Forsk. The apparatus is described, its defects discussed, and suggestions for its improvement put forward. A mixture consisting of 6 parts of kerosene, 3 of Diesel oil and 1 of petrol was found to form the best fuel.

The experiments showed that the flame-throwers can be used to the best advantage between 6 and 9 a.m. or 5.30 and 7.30 p.m. on benumbed, pairing, egg-laying, or newly emerged adults, and on hoppers congregated in dense bands on low growing bushes ; they should not be employed when the insects are concentrated on thick succulent plants, such as *Agave* spp. and *Euphorbia* spp. It is concluded that owing to the limitations and high cost of their use, flame-throwers are unsatisfactory as the chief means of locust destruction, but serve a very useful purpose as a subsidiary method.

SIMMONDS (H. W.). **A Method of Control for Banana Borer** (*Cosmopolites sordidus*).—*Agric. Leafl. Dept. Agric. Fiji*, no. 1, 3 pp. multigraph. [Suva] July 1931.

The injury caused by *Cosmopolites sordidus*, Germ., to bananas in Fiji results in a considerably reduced crop of fruit and the early deterioration of an estate. Investigations were carried out to devise a means of obtaining uninfested suckers for planting [*cf. R.A.E.*, A, xviii, 12]. Vacuum fumigation of the corms with carbon bisulphide did not destroy all the larvae and pupae, and it is doubtful whether the eggs were affected. Immersion of the suckers for 21 days, the water being kept 2 ins. above the point where the stem joins the corm, gave very satisfactory results, and the adoption of this method is recommended. Strong suckers that have one or more undeveloped lateral eyes in addition to the aerial stem, which usually dies after treatment, should be selected.

Aldaba (V. C.). **A Study of Condition of Coconut Trees in the Leaf-miner infested Area. i.**—*Philipp. J. Agric.*, ii, no. 1, pp. 51–65, 1 pl., 1 graph, 7 refs. Manila, 1931.

Observations have been made on the condition of coconut palms in the Philippines affected by the recent outbreak of the leaf-miner, *Promecotheca cumingi*, Baly [*R.A.E.*, A, xix, 64], with special reference to the effect of cutting off a number of the infested leaves. It was found that the growth of the leaves was not materially changed when from 7 to 16 leaves were cut off, nor was the rate of production of new leaves affected, and it may also be concluded that the production of fruits 20–27 months afterwards would not materially suffer. Cutting from 8 to 12 of the oldest leaves, however, caused heavy falling of nuts a little over a month old, counting from the opening of the spathe. The falling of nuts is a consequence of insufficient food material to support their growth, and the cutting off of infested leaves is found to have about the same effect on nut fall as if they are allowed to dry up naturally. When the attack is so persistent that each new leaf that appears is attacked and dries up, every new leaf produced is smaller than the last one and the tree ultimately dies of starvation. In such cases the end is generally hastened by the invasion of diseases such as bud rot (*Phytophthora faberi*).

Aldaba (V. C.), Elayda (A.) & Lanuza (E. A.). **A Study of Condition of Coconut Trees in the Leaf-miner infested Area. ii.**—*Philipp. J. Agric.*, ii, no. 1, pp. 69–80, 3 graphs, 2 refs. Manila, 1931.

The probable drop in the production of coconuts within the area infested by the leaf-miner, *Promecotheca cumingi*, Baly, in the Philippines [see preceding paper] has been estimated in a series of graphs from which the general conclusion is drawn that the peak of reduction in production (85 per cent.) will be found to have been reached in 1931, and that there will be a return to normal production in 1933.

Smith (F. F.) & Poos (F. W.). **The Feeding Habits of some Leaf Hoppers of the Genus** *Empoasca*.—*J. Agric. Res.*, xliii, no. 3, pp. 267–285, 18 figs., 12 refs. Washington, D.C., 1st August 1931.

The following is the authors' abstract: On the basis of results obtained in a study of the feeding habits of six species of *Empoasca*, the species were divided into two groups. The first group includes *Empoasca maligna*, Walsh, *E. abrupta*, DeLong, *E. filamenta*, DeLong, *E. bifurcata*, DeLong, and *E. erigeron*, DeLong. This group is characterised by a habit of feeding on the mesophyll tissue of the leaves and the regular production of definite spotting or stippling on the upper surface [*cf. R.A.E.*, A, xix, 489]. The more mature foliage seems to be preferred to that of the more succulent, younger leaves. Strains of *E. fabae*, Harris, which constitute the second group, evidently feed by preference upon the phloem or water-conducting tissue, and the well-being of this species seems to depend on the availability of fresh phloem tissue in succulent plant parts.

When *E. fabae* is confined to mesophyll tissue and the mesophyll-feeding species of the first group are confined to succulent phloem

tissue on growing tips and petioles, all die within a short time. These differences in feeding habits seem to be correlated with the physiology of the species.

The feeding by *E. fabae* in the phloem tissue or xylem vessels results in more serious injury to the plant than does the feeding by an equal number of individuals of the other species of *Empoasca* on the mesophyll tissue. No evidence was found that a toxin was introduced into the plant by any of the species. On the contrary, the studies indicate that injury by *E. fabae* is the result of interference with translocation of plant materials, which produces either wilting when xylem vessels are plugged or yellowing or reddening when the phloem is disorganised and plugged.

Bartley (H. N.) & Scott (L. B.). **Plowing as a Control Measure for the European Corn Borer in Western New York.**—*Circ. U.S. Dept. Agric.*, no. 165, 28 pp., 6 figs. Washington, D.C., August 1931.

In the first experiments in western New York in the control of *Pyrausta nubilalis*, Hb., carried out during the autumn of 1920 and spring of 1921, 100 per cent. of the larvae were killed by being buried in pits to a depth of 24 ins. or more. Further experiments were conducted from the autumn of 1921 to the spring of 1924 in hand burial of the larvae in various types of soil at different seasons of the year. The results indicated that no type of soil was particularly effective in reducing migration of buried larvae to the surface. A greater mortality was indicated when larvae were buried in late autumn than when they were buried earlier in the season while soil temperature was comparatively high. Little or no spring activity of buried larvae was noted until 1st April, or until the soil temperature had reached approximately 40° F. Many larvae buried to a depth of 6 ins. were capable of reaching the soil surface and subsequently producing fertile adults. Such larvae often hibernated in maize stalks and other plant material on the surface of the ground.

Ploughing experiments were begun in the autumn of 1923 and continued until the spring of 1927. In these ploughing was approximately 6 ins. in depth in clay loam, and many larvae were recovered from the soil surface either within sections of maize stalks or in corrugated paper traps. The number of larvae found in the traps of spring ploughings situated 12½ ft. from places of burial on the soil surface of which there was no débris was more than twice as great as the number reaching traps similarly situated where maize stalks had been placed on the soil surface. Approximately two-thirds of the migrating larvae hibernated in sections of maize stalks placed on the surface, and it is probable that practically all migrating larvae that failed to obtain shelter of some kind were destroyed by birds or insects. Observations in commercial plantings indicated the importance of removing débris liable to be brought to the surface by frost or cultivation, as migrating larvae taking refuge in it may survive the winter months and produce normal adults. Autumn ploughing usually resulted in greater larval mortality than spring ploughing [*cf.* *R.A.E.*, A, xviii, 398], but this advantage was offset by the fact that material ploughed in autumn is brought to the surface in large quantities by frost. The labour required to collect and destroy this litter is an undesirable factor connected with autumn ploughing.

REED (H. J.). **European Corn Borer Control—Progress Report 1931.**—*Circ. Purdue Univ. Agric. Expt. Sta.*, no. 178, 12 pp., 9 figs., 1 map. Lafayette, Ind., January 1931.

Owing to the importance of the maize crop in Indiana, the author points out the necessity for the maintenance of quarantine and the development of more satisfactory control measures against the European corn borer [*Pyrausta nubilalis*, Hb.], which in the north-eastern part of the State has spread from 39 townships to 303 during 1926–30. The various aspects of the problem and the present methods of cultural control are discussed [*cf.* *R.A.E.*, A, xix, 476].

REED (H. J.). **Codling Moth and Peach Worm Investigations. Progress Report 1931.**—*Circ. Purdue Univ. Agric. Expt. Sta.*, no. 179, 8 pp., 5 figs. Lafayette, Ind., January 1931.

The problem presented by the codling moth [*Cydia pomonella*, L.] and the oriental fruit worm [*Cydia molesta*, Busck] in Indiana is briefly reviewed, and the usual measures are recommended for the control of the former. Reference is made to the introduction of *Macrocentrus ancylivora*, Rohw., against *C. molesta* in 1929 [*R.A.E.*, A, xviii, 389]. It survived the winter as well as the hot dry summer of 1930, when further liberations were made.

MARSHALL (G. E.). **Preparation and Use of chemically treated Bands for Codling Moth Control.**—*Circ. Purdue Univ. Agric. Expt. Sta.*, no. 180, 4 pp., 4 figs. Lafayette, Ind., March 1931.

In experiments in Indiana in 1930, bands treated with a mixture of 1 lb. alpha-naphthylamine (technical grade), 1½ U.S. pints Diamond paraffin oil and a cake of parawax caught on an average ten more larvae of the codling moth [*Cydia pomonella*, L.] per band than those treated with beta-naphthol and oil in the same quantities but with no parawax [*cf.* *R.A.E.*, A, xvii, 721 ; xviii, 213], and twenty more larvae than untreated bands of the same material. The bands are made of cardboard 4 inches wide, one surface having 4 or 5 corrugations to the inch, and should be fitted closely to the trunk about 18–24 inches above the ground, the ends overlapping at least 1½ inches. They should be applied before 15th June and removed and burnt not later than the following 15th April. Both of these treated bands have been applied to the same trees in identical positions for three consecutive years with no visible injury. The method of preparing the bands by dipping rolls of corrugated paper in the hot chemicals and the precautions to be observed while doing so are described, and the relative cost of the application of untreated and treated bands is discussed.

YOTHERS (M. A.) & VAN LEEUWEN (E. R.). **Life History of the Codling Moth in the Rogue River Valley of Oregon.**—*Tech. Bull. U.S. Dept. Agric.*, no. 255, 34 pp., 13 graphs, 5 diag., 11 refs. Washington, D.C., August 1931.

A detailed account is given of studies on the seasonal history of *Cydia* (*Carpocapsa*) *pomonella*, L., on apple carried out during 1918–22 in the Rogue River Valley, Oregon, where there are two generations a year and a partial third. The dates of the appearance, maximum numbers and disappearance of the various stages in different broods are shown in

tables, graphs and diagrams. In 1922, the Tachinid, *Anachaetopsis tortricis*, Coq., was reared from material collected from beneath burlap bands. The parasites were scarce and somewhat localised in two or three orchards.

McGregor (E. A.). **The Red Spider on Cotton and how to control it.**—*Fmrs.' Bull. U.S. Dept. Agric.*, no. 831 revd., 14 pp., 9 figs. Washington, D.C., April 1931.

This is a revision of previous bulletins dealing with *Tetranychus telarius*, L., and its control on cotton in the southern United States [*R.A.E.*, A, iv, 511 ; vi, 214]. Dusting with sulphur as used against *Psallus seriatus*, Reut. (cotton fleahopper) [xv, 73] is recommended for the control of large infestations.

Snapp (O. I.). **Insects attacking the Peach in the South and how to control them.**—*Fmrs.' Bull. U.S. Dept. Agric.*, no. 1557, 42 pp., 29 figs., 3 refs. Washington, D.C., May 1931.

In this revision of a bulletin already noticed [*R.A.E.*, A, xvi, 636], *Cydia* (*Laspeyresia*) *molesta*, Busck (oriental fruit moth) is included among the major pests of peaches in the southern United States; especially in those districts where late-maturing varieties of peaches or apples are grown. Brief notes are given on the bionomics and control of two additional pests, *Pantomorus godmani*, Crotch (*fulleri*, Horn), and *Frankliniella tritici*, Fitch, and the method of applying paradichlorobenzene dissolved in crude cottonseed oil for the control of *Aegeria pictipes*, G. & R. (lesser peach borer) [xix, 630] is described.

Phillips (W. J.) & Barber (G. W.). **The Value of Husk Protection to Corn Ears in limiting Corn Earworm Injury.**—*Tech. Bull. Virginia Agric. Expt. Sta.*, no. 43, 24 pp., 7 figs. Blacksburg, Va., July 1931.

An investigation into the growing of different varieties of maize in Virginia, undertaken during 1922–1927, confirmed the view that ears with long, tight husks were much less damaged by *Heliothis obsoleta*, F., than those of any other kind [*cf. R.A.E.*, A, xix, 314]. Thirteen varieties of maize, most of which were standard varieties, were studied, and tables are given showing the percentage of each of six types of husk for each variety, the amount of injury from *H. obsoleta* and the average extent of injury for each variety over the entire period. The most effective protection is offered by a husk that extends for at least five inches beyond the tip of the cob and is tightly wrapped throughout its entire length. This generally limits the activity of the earworm to the long, narrow silk channel beyond the ear. Such husks also reduce the damage caused by other insects, fungi, and birds.

Fleury (A. C.). **Plant Quarantine Service.**—*Mon. Bull. Dept. Agric. California*, xix (1930), no. 12, pp. 811–831, 3 graphs. Sacramento, Cal., 1931.

Pests intercepted in California in 1930 included : *Ceratitis capitata*, Wied., in avocados, figs, mangos, and oranges, and *Dacus* (*Bactrocera*) *cucurbitae*, Coq., in cucumbers and dry onions, from Hawaii ; *Platyedra* (*Pectinophora*) *gossypiella*, Saund., in cottonseed from India and in bolls from Hawaii ; *Aleurocanthus woglumi*, Ashby, on *Citrus* leaves

from Central America; *Curculio* (*Balaninus*) spp. in chestnuts, acorns, filberts [*Corylus*] and pecan nuts from Mexico, Italy, Japan, Switzerland, Germany and various parts of the United States; *Chrysomphalus dictyospermi*, Morg., on *Citrus* fruits, coconuts, and palms from the Orient, Australia, Italy, Panama, Spain, Central America, Hawaii, Mexico and Florida; *Conotrachelus nenuphar*, Hbst., in cherries from Iowa and peaches from North Carolina; *Cylas formicarius*, F., in sweet potatoes from China; *Dialeurodes citri*, R. & H., on *Gardenia*, holly and orange budwood from various parts of the United States; *Forficula auricularia*, L., on apples and cherries from Oregon and Washington; *Cydia* (*Laspeyresia*) *molesta*, Busck, on ornamental species of *Prunus* from Japan; *C.* (*L.*) *splendana*, Hb., which does not occur in California, in chestnuts from Italy, Japan and Switzerland; *C.* (*L.*) *caryana*, Fitch, in pecans from Texas; *Prays citri*, Mill., in grapefruits from the Philippines; *Pseudaonidia duplex*, Ckll., on persimmons from the Orient; *Rhagoletis cingulata*, Lw., in cherries from Oregon; and *R. pomonella*, Walsh, in apples from New York.

MACKIE (D. B.). **Entomological Functions.**—*Mon. Bull. Dept. Agric. California*, xix (1930), no. 12, pp. 831–848. Sacramento, Cal., 1931.

A survey of fruit insects in California showed the codling moth [*Cydia pomonella*, L.] to be attacking cherries, apricots, peaches, plums, prunes, nectarines and oranges as well as apples, pears and quinces, its normal food-plants. The lesser bulb-fly [*Eumerus*] has been taken from grapefruit, tomatos and carrots. An unidentified Pyralid caused considerable injury to grapes in the San Joaquin Valley. *Epochra canadensis*, Lw., which normally feeds on wild *Ribes*, was found to be causing damage to cultivated currants and gooseberries.

Accounts are given of surveys carried out in connection with the dictyospermum scale [*Chrysomphalus dictyospermi*, Morg.], which has caused injury to avocados since 1924 and still exists in a number of nurseries; the citrus whitefly [*Dialeurodes citri*, R. & H.], which according to calculations should be exterminated in the Marysville area after two more annual campaigns; the walnut fly [*Rhagoletis suavis completa*, Cress.], which attacks several species of walnut and now occupies an area three times the size of that known to be infested prior to 1930; and *Platyedra* (*Pectinophora*) *gossypiella*, Saund., which was studied in Texas with a view to preventing its entry into California, examination of 95 per cent. of the cotton gins in the latter State giving a negative result.

The elm leaf beetle [*Galerucella luteola*, Müll.] appeared for the first time in several new localities in 1930, and emergency spraying operations, involving the use of 50,000 U.S. gals. of spray consisting of 4 lb. acid lead arsenate to 100 U.S. gals. water, were conducted. A timely application of this spray will reduce the beetles that have emerged from hibernation sufficiently to prevent serious damage. The area infested by *Listroderes obliquus*, Gyll., was found to have increased considerably. An investigation of injury caused by the Pyralid, *Myelois venipars*, Dyar (navel orange worm) showed that it attacks grapefruit, all kinds of oranges, lemons and figs, but though common, it was confined to split fruit.

Mechanical developments in the control of insect pests include the treatment in 1930 of about 140,000 acres of growing crops with

insecticides distributed from aeroplanes, the plants dusted varying from sugar-beet and lucerne to vines, *Citrus* and walnuts. Three different types of mechanical sterilisers for the treatment of citrus boxes have been developed. A progressive increase in the use of vacuum fumigation of material for export included treatment of persimmons for export to Hawaii to prevent them from carrying *Pseudococcus gahani*, Green, which does not occur there. By simply changing the type of container and treating in a single layer crate, a proper diffusion and distribution of hydrocyanic acid gas at a concentration lethal to the mealybugs was obtained. Tests of ethylene oxide gas in the treatment of almonds show this fumigant to be as effective against the eggs as against the larvae of the Indian meal moth and fig moth [*Plodia interpunctella*, Hb., and *Ephestia cautella*, Wlk.], but although it offers advantages over other fumigants, it is subject to pronounced reactions in the presence of moisture and is rather exacting in temperature requirements. Tests with various liquid insecticides under vacuum for the control of Marlatt scale [*Phoenicococcus marlatti*, Ckll.] on date offshoots showed that the situation of individual scales in colonies requires compounds containing oil for proper penetration. Only 12 living scales remained in colonies estimated to contain over 100,000 individuals after treatment with a commercial emulsion containing nicotine and oil. Even though the vacuum utilised was high (29 ins.), there was practically no injury, the offshoots making good growth. As the present heat treatment causes death of the apical bud when it is 100 per cent. lethal to the scale, it is particularly desirable to discover a method that will exterminate the latter without injury to the plant.

Bentley (G. M.) & Rogers (J. L.). **Work of Termites or "White Ants" in Tennessee.**—*Bull. Tennessee Div. Pl. Dis. Control*, no. 49, 22 pp., 13 figs., 10 refs. Knoxville, Tenn., August 1931.

Practically all of the damage due to termites in Tennessee is caused by the subterranean species of the genus *Reticulitermes*. *R. flavipes*, Koll., and *R. virginicus*, Banks, in particular are associated with damage to buildings and timber. A general description and account of the life-history of termites is given, and the precautions against attack in modern buildings are explained, with brief notes on the control of infestations in greenhouses and plants in the field.

Proceedings, Thirty-third Annual Meeting of the Maryland State Horticultural Society, January 6-7, 1931.—*Ann. Rep. Maryland Agric. Soc. 1931*, reprint 116 pp. Baltimore, Md., 1931.

A. J. Farley (pp. 38–50) discusses spraying experiences in New Jersey during 1930 and in particular the use of cresylic acid in oil emulsion for the control of Aphids on apple [*R.A.E.*, A, xix, 168, 264] and flotation sulphur as a summer fungicide. When the latter is combined with lead arsenate, the addition of lime is essential on peaches and other stone fruits, though unnecessary on apple. A spreader is desirable in this combination, and very finely divided powdered sweet skimmed milk is recommended for the purpose. The use of casein-lime spreader with this spray may result in severe injury, unless lime is also added at the rate of about 8 lb. to 100 U.S. gals. W. S. Hough (pp. 50–56) discusses the life-history of the codling moth [*Cydia pomonella*, L.] in

Virginia with reference to the best moment for applying remedies against it. As the young larva spends some time wandering over the foliage and fruit, the application of an arsenical spray just before hatching occurs is very effective. From 54 to 80 per cent. of the young larvae were successful in entering unsprayed fruit, the proportion depending on the temperature at the time of hatching and attack. On sprayed apples the roughness of the spray deposit appears to stimulate the attack of the young larva, and better control has been obtained when lead arsenate has been used without a spreader to give the spot type of coverage. E. N. Cory, in describing the prevalence of *C. pomonella* in Maryland in 1930 (pp. 56–64), stated that where the Extension Service spray schedule was thoroughly carried out, fair control was almost invariably obtained. Experience showed that a large percentage of the injury was due to the first generation. Banding is considered valuable as a supplementary measure where the moth is present in large numbers.

D. F. Fisher (pp. 64–74) and Hough & A. B. Groves (pp. 74–88) discuss the latest developments in removing spray residue from fruit. No dry cleaning method has been devised that will consistently remove more than about 30 per cent. of the arsenic on apples ; washing with hydrochloric acid will generally remove 75 per cent. or more. The washes recommended have been described elsewhere [*R.A.E.*, A, xix, 307, 346]. Some use has been made in the Pacific Northwest of alkaline washes ; they have, however, a number of disadvantages, including a solvent action on fruit wax, which may result in shrivelling in storage, and are difficult to rinse off. Descriptions are given of the latest types of machines used for washing the residue from apples.

La Peste de los Olivares de Ilo.—*La Vida agric.*, viii, no. 93, pp. 532–536, 2 figs. Lima, 1st August 1931.

A Pyralid, *Diaphania* sp., occurs in almost all olive plantations in Peru, and in 1930 caused serious crop losses (up to 60 per cent.) in the Ilo valley. Infestation begins in April or May, is at its height in August and September, and ceases during the summer (December–March). The larval stage lasts about 3 weeks, and the pupal about 2. The larvae feed on the shoots, on which the eggs are laid, young leaves, peduncles of the flowers and fruits, and the fruits themselves. Calcium arsenate dust, applied by a power duster capable of reaching a height of at least 45 ft., is effective in control.

da Costa Lima (A.). **A proposito da** *Acropyga pickeli* **Borgm., 1927 (Hymenoptera : Formicoidea).**—*Bol. biol.*, fasc. 17, pp. 2–8, 1 pl., 10 refs. Rio de Janeiro, 10th August 1931.

The author considers that *Acropyga pickeli*, Borgm., the ant recorded as fostering the Coccid, *Rhizoecus coffeae*, Laing, infesting coffee in Brazil [*R.A.E.*, A, xvii, 396], and *A. goeldii*, For., are both identical with *A. decedens*, Mayr.

Leonard (M. D.). **Report of the Division of Entomology . . . 1929–30.**—*Ann. Rep. Porto Rico Ins. Expt. Sta. Rio Piedras 1929–30*, pp. 110–123. San Juan, P.R., 1931.

Some of the investigations in Porto Rico in 1929–30, to which reference is made, have already been noticed [*R.A.E.*, A, xix, 198, 199].

A new method has been devised for cleaning banana corms infested with *Cosmopolites sordidus*, Germ., which is now distributed throughout the greater part of the Island. The outer layers of scales were stripped off the corms with a knife, and the tissues containing weevils, larvae or pupae, and those at the junction of the stem with the corm where the eggs occur were removed. The corms were then planted at a considerable distance from other bananas and produced a large proportion of healthy plants and a satisfactory number of large sized bunches of fruits. The mother plants were cut down in February after removal of the crop, and the best corms selected for replanting some distance away. Some eggs or larvae, however, invariably escape detection, and any plants showing infestation should be dug out immediately, traps of sliced banana corms being used to catch the adults. Preliminary steps have been taken for the introduction from Java of the Histerid, *Plaesius javanus*, Er., and the Leptid, *Chrysopilus ferruginosus*, Wied., which are predacious upon the immature stages of *C. sordidus*.

Insects recorded during the year included: *Diatraea saccharalis*, F., which has been more injurious to sugar-cane than for years past; *Scapteriscus vicinus*, Scud., on sugar-cane and tomatos; *Protoparce sexta* var. *jamaicensis*, Butl., *Epitrix cucumeris*, Harr., *Dicyphus luridus*, Gibson, and *D. prasinus*, Gibson, on tobacco; *Chrysomphalus ficus*, Ashm., *Lepidosaphes beckii*, Newm., *Lachnosterna* (*Phyllophaga*) spp., *Diaprepes abbreviatus*, L. (*spengleri*, L.), *Tetranychus* sp., and *Phyllocoptes oleivorus*, Ashm., on *Citrus*; *Strategus quadrifoveatus*, P. de B., which was destructive to almost all coconut plantings; *Leucoptera coffeella*, Guér., on coffee; *Diabrotica graminea*, Baly, *Cerotoma ruficornis*, Ol. (*denticornis*, F.), *Corythuca gossypii*, F., *Empoasca fabanae*, DeLong, and *Eudamus* (*Goniurus*) *proteus*, L., on beans; *Epitrix cucumeris*, *Aphis gossypii*, Glov., *Corythaica monacha*, Stål, and *Psara periusalis*, Wlk., on egg-plant [*Solanum melongena*]; *Thrips tabaci*, Lind., on onions; *Cylas formicarius*, F., and *Agromyza ipomaeae*, Frost, on sweet potatoes; *Dichomeris piperata*, Wlsm., on lucerne; *Fundella cistipennis* Dyar, *Heliothis virescens*, F., and *Etiella zinckenella*, Treit., on cowpeas; and *Alabama argillacea*, Hb., *Platyedra* (*Pectinophora*) *gossypiella*, Saund., *Nepticula gossypii*, Forbes & Leon., *Dysdercus andreae*, L., *D. sanguinarius*, Stål (*neglectus*, Uhl.), *Corythuca gossypii*, *Aphis gossypii*, *Saissetia nigra*, Nietn., and *Eriophyes gossypii*, Banks, on cotton.

[Ruhmann (M. H.). Report of the] **Entomology Branch.**—*25th Ann. Rep. Br. Columbia Dept. Agric. 1930*, pp. G49–G51. Victoria, B.C., 1931.

Insects attacking fruit trees in British Columbia during 1930, most of which were present in numbers much below normal, included *Lygus pratensis*, L., which showed a preference for pears but caused only local injury, mainly in orchards with heavy cover crops. Infestations by *Cydia pomonella*, L., were very light. *Nysius ericae*, Schill. (false chinch bug) was found to be present throughout a district where serious injury to cherries was reported, but it could not be definitely ascertained whether the bug was responsible for the damage. *Paratetranychus pilosus*, C. & F., is becoming more widespread in several fruit-growing areas.

Potatoes and onions, and in some sections cereals, were severely attacked by wireworms, which were responsible for a loss of 60 per cent.

in one onion crop. *Pheletes canus*, Lec., and *Limonius discoideus*, Lec., appear to be the most prominent species. *Thrips tabaci*, Lind., caused serious damage in some large fields of onions. *Plutella maculipennis*, Curt., was unusually abundant and injurious to crucifers.

LINDBLOM (A.) & SJÖBERG (K.). **Studier rörande frukträdskarbolineum.** [Studies dealing with Fruit-tree Carbolineum.]—*Medd. CentAnst. Försöksv. Jordbr.*, no. 397, *Lantbruksentom. Avd.*, no. 61, *Kemisk. Avd.*, no. 44, 28 pp., 5 diag., 7 refs. Stockholm, 1931. (With a Summary in German.)

The results are recorded of an investigation carried out to determine the practical value of a number of commercial tar-distillates for fruit trees and to ascertain the relationship between their effectiveness in the destruction of insects, particularly of the eggs of *Psylla mali*, Schm., on apple, and their chemical and physical properties. Field experiments, in which the trees were sprayed immediately before the buds swelled with weak, normal and strong concentrations, gave satisfactory results in most cases. A further series of laboratory experiments determined the minimum concentration effective for use in spraying in the middle of April and the middle of March in the case of each preparation tested. An attempt to determine the effectiveness of tar-distillates by chemical analysis and measurements of surface tension at various dilutions showed that there is no recognisable connection between the minimum concentration and the chemical and physical factors except perhaps in respect of the bases, a higher content of which seems to increase the toxic effect. An increased phenol content does not appear to produce greater toxicity.

Tests were also carried out with eggs of *Paratetranychus pilosus*, C. & F., in view of the general opinion that tar-distillates are not effective against them. The results obtained were in many cases inconclusive but those of a few successful tests are tabulated. One preparation was very effective at 7 per cent. strength, but it was one of those least successful in the experiments against *Psylla mali*. For the control of *Paratetranychus* it would have to be applied about the middle of March.

AHLBERG (O.). **Översikt över de viktigare Kulturväxternas allmännaste Skadedjur.** [Review of the commonest Insect Pests of the more important Plants.]—*Medd. CentAnst. Försöksv. Jordbr.*, no. 401, *Lantbruksentom. Avd.*, no. 62, 39 pp., 4 pls., numerous refs. Stockholm, 1931.

Brief notes are given on the injury caused by and the control measures employed against the more important insect pests of the chief cultivated plants and trees of Sweden, with recommendations for the use of members of a reporting organisation in making records of the occurrence of such pests.

HILLE RIS LAMBERS (D.). **Contribution to the Knowledge of the Aphididae (Hom.) I.**—*Tijdschr. Ent.*, lxxiv, no. 2–3, pp. 169–183, 2 figs., 26 refs. Amsterdam, 1st September 1931.

This is the first of a series of articles dealing with Aphids, especially those occurring in Holland. It includes notes on the synonymy of a number of species and descriptions of two new ones.

Uyttenboogaart (D. L.). **Vergelijkende studie over de soorten van het genus *Otiorrhynchus* s. str. (Col. Curc.), behoorende tot Reitter's 4e en 5e Rotte.** [A comparative Study of the Species of the Genus *Otiorrhynchus* s. str. belonging to Reitter's 4th and 5th Groups.]—*Tijdschr. Ent.*, lxxiv, no. 2–3, pp. 281–298. Amsterdam, 1st September 1931.

Otiorrhynchus lugdunensis, Boh., is considered specifically distinct from *O. hungaricus*, Germ. A variety of the former is responsible for injury to fruit trees in Limburg, Holland [*cf. R.A.E.*, A, xvii, 635].

Feytaud (J.). **La question doryphorique au début de la campagne 1931.**—*Rev. Zool. agric.*, xxx, no. 1, pp. 1–12, 2 maps. Bordeaux, January 1931.

The situation regarding *Leptinotarsa decemlineata*, Say, on potato in France at the beginning of the 1931 campaign is reviewed [*cf. R.A.E.*, A, xviii, 595]. Infestation increased during 1930 in all directions both in area and density ; but owing to a reorganisation of the system of campaign and increased vigilance in inspection, it is probable that far fewer foci have escaped detection than in previous years. A small number of new infested zones, each containing more than three foci of infestation, have been created, and the protective zones have been united to form a uniform whole. The total number of zones now involve 21 Departments, 7 of which come entirely within them. The number of communes classed as infested now amounts to 1,926, of which, however, only 1,074 were found to contain one or more foci of infestation in 1930.

Watzl (O.). **Ein seltener Zuckerrübenschädling** (*Gryllus frontalis* **Fieb.**). [A rare Pest of Sugar-beet.]—*Neuheiten Geb. PflSchutzes*, 1931, no. 3, pp. 65–66. Vienna, July 1931.

In the spring and early summer of 1929, considerable damage was caused by *Gryllus frontalis*, Fieb., to beet in a single field in Lower Austria. The adults, which were very abundant, attacked the young plants at the level of the soil, severing the stems from the underground part. No larvae or adults were observed in September, probably because the field had been flooded for a week in July.

Georgescu (C.). **Macul de lacuste diu pădurile Dobrogei de Sud.** [Injury to Foliage by Grasshoppers in the Forests of the southern Dobrudja.]—*Rev. Pădurilor*, xlii, pp. 799–809. [Bucharest] 1930. (Abstract in *Neuheiten Geb. PflSchutzes*, 1931, no. 3, p. 81. Vienna, July 1931.)

In 1930, *Isophya speciosa*, Friv., infested a forest area of over 7,400 acres in Rumania, the winter having been a mild one, and between the beginning of April and mid-June it defoliated about 1,200 acres. Preference was shown for oak, lime, field maple [*Acer campestre*], elm, pear and apple, whereas *Crataegus*, *Cornus*, *Viburnum*, *Rhus* and *Acer tataricum* were left untouched.

Bongini (—). **Osservazioni biologiche sulla mosca della ciliege in Piemonte.** [Biological Observations on the Cherry Fruit-fly in Piedmont.]—*Boll. Lab. sper. Fitopat.*, viii, no. 3, pp. 4–9. *Sine loco*, n.d. (Abstract in *Neuheiten Geb. PflSchutzes*, 1931, no. 3, pp. 86–87. Vienna, July 1931.)

In Piedmont, the adults of *Rhagoletis cerasi*, L., emerge in May, and eggs are laid at the end of the month under the epidermis of cherries that are just turning red. The larvae hatch in 3–4 days and reach maturity about the end of June, when they enter the soil and pupate close to the surface. For control, a mixture of 6 parts of molasses, 1 of lead arsenate and 200 of water should be used as a bait in containers, or preferably as a bait-spray at the rate of 3½ pints to a tree. Other measures recommended include destruction of the pupae by loosening the surface of the soil and letting poultry run in the orchard in the summer, and by digging over the soil in the winter; preventing the emergence of the flies by ramming the soil in April; and the use of carbon bisulphide or paradichlorobenzene as soil fumigants. Cherries may be freed of larvae by submerging them in cold water.

Winterhalter (W.). **Ueber Saugwanzen an Fichtenrinden.** [On Bugs infesting Spruce Bark.]—*Schweiz. Z. Forstw.*, lxxxii, pp. 198–199, 1 pl. Bern, 1931. (Abstract in *Neuheiten Geb. PflSchutzes*, 1931, no. 3, p. 89. Vienna, July 1931.)

The Lygaeids, *Gastrodes ferrugineus*, L. (*grossipes*, DeG.) and *G. abietis*, L., are recorded from two localities in Switzerland as attacking spruces, the bark of which was cracked as a result of exposure to the sun. At the beginning of March they were numerous under the cracks, causing the bark to peel off in layers.

Braun (K.). **Tätigkeitsbericht der Biologischen Reichsanstalt für Land- und Fortswirtschaft, Zweigstelle Stade, . . . vom 1. April 1930 bis 31. März 1931.** [Report from 1st April 1930 to 31st March 1931 of the Stade Branch of the Imperial Biological Institute for Agriculture and Forestry.]—*Altländer Ztg.*, 1931, nos. 78, 82, 85, 88, 93, 96, 97, 100, 104, 107, reprint 9 pp. Jork, 1931.

As the spring of 1930 was favourable for the development of apple blossom in the fruit-growing districts of the Lower Elbe, the damage caused by *Psylla mali*, Schm., was not severe. The application of carbolineum sprays in preceding years has given very good results, scarcely any eggs being found on the trees in treated areas, though an average of 15 to an inch occurred on the branches of those in unsprayed orchards. The larvae of the winter moth [*Cheimatobia brumata*, L.] caused complete defoliation of the trees in many localities. In the laboratory, spraying the eggs with 10 per cent. carbolineum, or 5 per cent. dinitro-ortho-cresol, gave excellent results, provided that the sprays were applied not more than a fortnight before the larvae hatched. The moths were very abundant in October and November, but most of them were caught by adhesive bands. Spraying the trees with carbolineum was not detrimental to earthworms [*cf. R.A.E.*, A, xv, 514], as the insecticide that dropped off the branches did not penetrate deeply enough into the soil.

An outbreak of the larvae of *Charaeas graminis*, L., occurred in May, severe damage being done to meadows over large areas. In October, the eggs were abundant in pasture land. The Galerucid, *Lochmaea suturalis*, Thoms. [*cf.* xviii, 662] was present in negligible numbers only, especially after the middle of June, when only a few larvae could be found on heather [*Calluna vulgaris*].

MEYER (E.). **Beobachtungen und Untersuchungen zur Biologie und Bekämpfung der Forleule.** [Observations and Investigations on the Biology and Control of the Pine Moth.]—*Z. angew. Ent.*, xviii, no. 1, pp. 1–56, 24 figs., 35 refs. Berlin, June 1931.

An account is given of the results of observations on the pine moth [*Panolis flammea*, Schiff.] made about 1,200 ft. above sea level and about 18 miles south of Nuremberg, where a severe outbreak occurred in 1930. The following is taken from the author's summary: Measurements of temperature and humidity in three different stands showed negligible variations in the tree-crown space, so that the noticeable differences in larval development cannot be ascribed to them. Pupae are more abundant in ground litter consisting of moss, raw humus, and bilberry than in that containing pine-needles, heather and *Cladonia*, in which there is more danger of desiccation. The best conditions for them are afforded by the former type of litter on permeable soil, on which, however, the latter type, especially if the layer is thin, is most unfavourable both to the moth and to its Ichneumonid and Tachinid parasites. Larvae about to pupate do not migrate from unsuitable places, though immature larvae leave defoliated stands in search of food.

Emergence of the adults is favoured by high temperatures and checked by rain. The lowest temperature at which the moths emerged was 5° C. [41° F.]. The duration of the emergence period was the same in both types of litter, so that it may be assumed that the temperatures are the same in both. Most of the eggs are laid at 10–13° C. [50–55·4° F.] and 70–80 per cent. relative humidity, a higher degree of humidity being unfavourable for oviposition. High temperatures favour the hatching of the larvae, whereas moisture and atmospheric pressure seem to have little effect. The mortality of the young larvae is greater in stands of old trees than in pole-woods, probably owing to differences in the development of the May-shoots, but the more severe infestation of the latter is also partly due to better ground litter conditions for the pupae. The older larvae feed by day as well as by night. Excreta counts proved the value of dusting with an arsenical and that young larvae are more susceptible to the poison than old ones.

STELLWAAG (F.). **Giftigkeit und Giftwert der Insecticide. vi. Teil: Ziele und besondere Methodik bei der Bestimmung der Giftigkeit im Individualversuch.** [Toxicity and toxic Value of Insecticides. Part VI. The Aims of and special Methods for Determination of Toxicity in individual Tests.]—*Z. angew. Ent.*, xviii, no. 1, pp. 113–132, 13 figs., 16 refs. Berlin, June 1931.

For satisfactory tests of insecticides, exact quantitative measurements are needed for comparison. The methods adopted in various parts of the world are reviewed, the disadvantages of each being stated.

The sandwich method described by Campbell and Filmer [*R.A.E.*, A, xviii, 311] represents a notable advance, but experience of it for three years has suggested certain modifications that eliminate possible errors and reduce the cost. They include the substitution of large rectangular cover-glasses for those of the same size as the disks of leaf, to minimise inaccuracy in weighing. Moreover, as the preparation of sandwiches takes time and involves possibilities of error, the disks of leaf are simply brushed with fresh starch paste and the dust allowed to settle on the sticky surface. When the paste is dry, the disk is placed in a Petri dish, leaning on the edge, so that the cork holder is dispensed with. After the insects have fed, the partly consumed disk is projected with an enlargement of 3 diameters in a vertical enlarger, and the resulting reproduction is measured by placing over it a piece of transparent paper squared in millimetres.

Watzl (O.). **Ueber die Anfälligkeit verschiedener Weizensorten für die Halmfliege** (*Chlorops taeniopus* **Meig.**). [On the Susceptibility of various Varieties of Wheat to Attack by the Wheat Stem Fly, *C. taeniopus*.]—*Z. angew. Ent.*, xviii, no. 1, pp. 133–153, 2 diag., 13 refs. Berlin, June 1931.

A detailed account is given of the results of an examination in June 1929 of 30 varieties of wheat in 122 experimental plots in a district of Czechoslovakia in which *Chlorops taeniopus*, Mg., is abundant. All the plots showed infestation but it varied greatly in degree, being progressively more severe according to the lateness of the date on which the wheat began to sprout. There were, however, some exceptions to this, due to causes that could not be elucidated. On an average, the more susceptible varieties have somewhat thicker stems and broader leaves than the less susceptible ones, but the former are all late in sprouting, and no relation independent of the sprouting date could be traced. Varieties of wheat that develop slowly should not be grown in districts infested with *C. taeniopus*, unless early sprouting is promoted by early sowing, the use of artificial manures, etc.

Körting (A.). **Beobachtungen über die Fluggewohnheiten der Fritfliege und einiger Getreidethysanopteren.** [Observations on the Flight-habits of the Frit-fly and of some Thysanoptera infesting Cereals.]—*Z. angew. Ent.*, xviii, no. 1, pp. 154–160. Berlin, June 1931.

Trapping experiments, carried out in Prussia from June to October 1929, with a post about 18 ft. high covered with parchment paper treated with an adhesive showed that *Oscinella* (*Oscinis*) *frit*, L., chiefly flies close to the ground, whereas *Limothrips cerealium*, Hal., and *Haplothrips aculeatus*, F., prefer to fly higher than 3 ft. Other tests, in which 2 screens were used, the surfaces of which faced the four cardinal points, indicated that from 28th August to 10th October flights of all three insects occurred almost daily. The number decreased in October. Most of the flies were caught on the leeward sides of the screens, whereas most of the thrips were taken on the windward ones. Attention is drawn to the conflicting results obtained by the author and by Riggert [*R.A.E.*, A, xix, 425].

Vollmer (O.). **Kleidermotten als Fresser lebender Zecke.** [Clothes Moths as Feeders on living Ticks.]—*Z. angew. Ent.*, xviii, no. 1, pp. 161–174, 4 figs. Berlin, June 1931.

Larvae of the clothes moth, *Tineola bisselliella*, Humm., were found at the Tropical Diseases Institute, Hamburg, apparently feeding on the cast skins of snakes and the larvae of ticks ; and in experiments they attacked eggs and living larvae of *Ornithodorus moubata*, Murr., and living larvae of *Argas persicus*, Oken. It is thought probable that in hot countries *T. bisselliella* may have a predacious mode of life and that it may, perhaps, have adapted itself to wool, etc.

Schewket (N.). **Untersuchungen über Möhrenblattsauger.** [Investigations on Carrot Leaf Suckers.]—*Z. angew. Ent.*, xviii, no. 1, pp. 175–188, 9 figs., 15 refs. Berlin, June 1931.

These observations, the results of which are compared with those of other workers [*R.A.E.*, A, ix, 452 ; xviii, 231], were made in 1929 and 1930 in a district in Central Germany where carrot leaf-curl caused by the Psyllid, *Trioza viridula*, Zett., occurred. In 1929, oviposition began about the beginning of July, most of the larvae were mature by mid-August, and the resulting adults mated and then left the carrot fields without ovipositing, this migration being over by mid-October. In 1930, the first adults were observed at the end of May, and young plants showed the first signs of leaf-curl early in June. Oviposition began on 12th June, and adults of the new generation were observed on 23rd July. Adult mortality did not appear to be heavy during hibernation. Leaf-curl is apparently not produced by first or second instar larvae. It increases as the larvae become mature and is most noticeable when the adults are present. *Trioza nigricornis*, Först., the egg, larvae and adult of which are briefly described, also occurred, but caused no leaf-curl. It began to leave the carrot fields in the first half of August, but, unlike *T. viridula*, it did not immediately seek winter-quarters, its larvae being found on parsley until late in autumn. It appears to have as many generations as weather permits.

Natural enemies of both Psyllids included a number of Coccinellids, an undetermined Chrysopid and the Aphelinid, *Tetrastichus* (*Geniocerus*) *inunctus*, Nees. Tests with various insecticides showed that kerosene emulsion, though actually the least effective, was the only one not too expensive to use.

Zolk (K.). **Orase-öölane** (*Agrotis segetum* **Schiff.**) **ja tema tõrje.** [*Euxoa segetum* and its Control.]—*Tartu Ülikooli Entom.-katsejaama teadaanded* no. 10, 49 pp., 19 figs. Dorpat, 1930. (Abstract in *Z. angew. Ent.*, xviii, no. 1, pp. 199–200. Berlin, June 1931.)

An account is given of observations consequent on a severe outbreak of *Euxoa* (*Agrotis*) *segetum*, Schiff., that began in Estonia in 1927. The preceding winter was comparatively cold and dry, and July was very hot and dry. The author concludes that low temperatures and continued rain in June and July are very unfavourable to this cutworm and that heavy soils are less favourable than porous ones. The moths, which live for 8–12 days, are on the wing in late June and early July. The greatest number of eggs observed to be laid by a female was 923,

but up to 1,680 were found in the oviducts. Most of the eggs were deposited on the roots of couch-grass or on straw in stable manure, but the latter does not seem to be so important an attraction as has been supposed. At an average temperature of 22·5° C. [72·5° F.] the larvae hatch in 9–12 days. The first four of the six instars occupy 25–30 days, after which the larva increasingly becomes a soil inhabitant. Feeding occurs at night or in cloudy weather. Most of the larvae overwinter at a depth of 6–8 ins. ; in 1928, they emerged from hibernation in early May, and the majority had pupated by the 24th of the month. Pupation occurs at a depth of $\frac{1}{5}$–$1\frac{1}{4}$ ins.

Natural factors of control observed included a fungus (*Tarichium*), polyhedral disease, and parasites, of which *Amblyteles fuscipennis*, Wesm., and *Apanteles spurius*, Wesm., were the chief. Late sowing in a field free from weeds is recommended for avoiding infestation, and trenches or used motor-oil applied in strips are effective barriers against the larvae. They may be destroyed by a poison-bait of 10 lb. molasses, 3 lb. sodium arsenate, 40 lb. wheat bran, 100 lb. chopped turnips and 10 gals. water, this quantity being sufficient for a little over half an acre.

A. D. **Der Kampf gegen den Arvenspinner in der Oberförsterei Kulatukskoje (Bezirk Irkutsk, Sibirien).** [The Campaign against the Cedar Moth in the Forest of Kulatukskoe (Irkutsk Region, Siberia).] —*Forstwirtsch. u. Holzind.*, vii, no. 7, pp. 73–74. Leningrad, 1929. (Abstract in *Z. angew. Ent.*, xviii, no. 1, p. 201. Berlin, June 1931.)

Floroff (D.). **Der Sibirische Spinner.** [The Siberian spinning Moth.] —*Forstwirtsch.*, no. 4, pp. 85–88, Moscow, 1929. (Ref. *Plant Protection*, vi, p. 863.) (Abstract in *Z. angew. Ent.*, xviii, no. 1, p. 201. Berlin, June 1931.)

The unusual outbreak of *Dendrolimus sibiricus*, Tshtv., in eastern Siberia in 1921 resulted in the entire defoliation of about 3,800 sq. miles of conifers. The trees were subsequently attacked by various bark-beetles, which completely destroyed their timber value. The distribution of the moths was largely assisted by the wind, which sometimes carried them a distance of over 6 miles. It was found that the larvae were able to withstand starvation for three weeks and that those that hatched in September ate on an average 2 needles a day until entering hibernation, 10 a day in the following spring, 50 in the autumn and 80 in the second spring. Various experiments on control were carried out, special attention being devoted to dusting from aeroplanes.

Polubojarinoff (I. I.). **Die Kiefernbestandsschädlinge im Reviere Arbuschenskij Ljess des Gouv. Uljanow.** [Pests of Pine Forests in the Region of Arbushenskiĭ Les in the Ul'yanov Government.]—*Sammelband wiss. Forstwirtschaftsver. Leningr. Forstinst.*, ii, pp. 45–52. Leningrad, 1929. (Abstract in *Z. angew. Ent.*, xviii, no. 1, pp. 205–206. Berlin, June 1931.)

An unusual increase in the numbers of injurious insects took place in pine forests in the Ul'yanov [former Simbirsk] Government as a result of damage by fire and the subsequent weakening of the trees by drought. The principal pests present were : *Ips acuminatus*, Gyll.,

which chiefly occurred in the upper part of dead and dying trunks, and also attacked healthy trees at the edge of exposed stands; *Myelophilus (Blastophagus) minor*, Htg.; *Ips sexdentatus*, Börn.; *Xyloterus lineatus*, Ol.; *Monochamus galloprovincialis*, Ol., the larvae of which attacked the wood and the adults the young twigs and bark of the upper part of the trunks, rendering them susceptible to the attacks of secondary pests; *Pissodes piniphilus*, Hbst.; *Sirex (Paururus) juvencus*, L.; and *Aradus cinnamomeus*, Panz., which infested young pines, causing the drying up of the terminal shoots in about 60 per cent. of the trees.

Schwerdtfeger (F.). **Die Ermittlung der Mortalität von Raupen während einer Insektenepidemie. Ein Beispiel für die Anwendung von Kotfängen zur Behandlung epidemiologischer Probleme, zugleich ein Beitrag zur Epidemiologie des Kiefernspanners.** [The Determination of the Mortality of the Larvae during an Insect Outbreak. The Collection of Excreta in the Treatment of epidemiological Problems; a Contribution to the Study of the Outbreaks of the Pine Geometrid.]—*Anz. Schädlingsk.*, vii, no. 8, pp. 85–90, 6 graphs, 5 refs. Berlin, 15th August 1931.

This is a detailed discussion of the method adopted during investigations on the pine moth [*Bupalus piniarius*, L.] in Germany to determine the abundance and mortality of the larvae by collecting their excreta on sheets of waxed paper and weighing them. More accurate estimates are thus obtained than by felling a certain number of infested trees and counting the eggs and larvae present on the crowns. It is essential to ascertain the amount of excreta produced in a given time by all the larvae present on the trees in a definite area, and that produced by one larva. The number of larvae and the percentage of mortality may thus be calculated.

Voigt (G.). **Bemerkungen über die Rebenminiermotte,** *Antispila rivillei* **Stt.** [Notes on the Vine mining Moth, *A. rivillei*.]—*Anz. Schädlingsk.*, vii, no. 8, pp. 90–93, 1 fig., 14 refs. Berlin, 15th August 1931.

Antispila rivillei, Staint., has been recorded on vines from three localities in eastern Bulgaria, where it has two generations a year and has been established for a number of years in spite of the somewhat severe winter. In view of the danger of its introduction and establishment in Germany, a description is given of the type of mines it makes in the leaves. Though the fruit is not attacked, it is contaminated by the excreta of the mature larvae and the webs they make to attach their pupal cases to the leaves. These cases they cut out from the epidermis before abandoning the mines.

Henze (—). **Ein neuer Weg in der Bekämpfung der Nonne.** [A new Way to control the Nun Moth.]—*Forstl. Wschr. Silva*, xix. Tubingen, 1931. (Abstract in *Anz. Schädlingsk.*, vii, no. 8, p. 95. Berlin, 15th August 1931.)

Experiments in Germany in 1928–30 indicated that collection of the adults may be of value for the control of the nun moth [*Lymantria monacha*, L.], especially as a period from 3 to 5 years is required for the

development of an outbreak and several days elapse between emergence and oviposition. The moths rest by day on the trunks of the trees, usually within 7 ft. of the ground ; to reach those that occurred higher the collectors were supplied with "swatters" attached to sticks. To estimate the percentage of moths collected, 100 dummy moths made of paper were placed on the trees without the knowledge of the collectors. In two tests 75 and 81 of these dummies were collected on the first day, and a few more subsequently. This method is considerably cheaper than dusting or banding, and has the advantage that natural enemies are not destroyed.

LEBEDEV [A.] & SAVENKOV [O.]. **Die Bedeutung der Fanggrabenmethode für die Kenntnis der Insektenfauna der Kiefernbestände.** [The Value of Trap Ditches towards a Knowledge of the Insect Fauna of Pine Forests.] [*In Ukrainian.*]—Kiev, 1930. (Abstract in *Anz. Schädlingsk.*, vii, no. 8, pp. 95–96. Berlin, 15th August 1931.)

In the summer of 1928 an attempt was made in a forest near Kiev to determine the insect population by trapping the insects in ditches and counting them. During the period from 18th May till 1st October, 22,329 insects were collected from two ditches, 588 and 2,975 feet long, that were dug in a mixed forest. The numbers of the different families and species captured are given. Of these, injurious species formed 54·77 per cent., beneficial ones 14·3 per cent., and neutral ones 31·1 per cent. The maximum number were caught in the spring and beginning of summer (June) ; a considerable decrease was then noticed, followed again by a rise in August and September.

BÖRNER (C.). **Die Verbreitung der Reblaus in Deutschland nach dem Stande des Jahres 1930.** [The Distribution of *Phylloxera* in Germany as shown by the Position of 1930.]—*NachrBl. deuts. PflSchDienst*, xi, no. 9, pp. 73–75. Berlin, September 1931.

The data for 1930 show an increase in infestation of vineyards by *Phylloxera* as compared with the average for 1924–1929.

VOELKEL (H.) & others. **Berichte und Versuche über Entwicklung und Bau eines Streuapparates für das reichseigene Flugzeug Type Caspar C32.** [Reports and Experiments on the Development and Construction of a Dust-Distributor for the German official Aeroplane of the Caspar C32 Type.]—*Mitt. biol. Reichsanst. Land- u. Forstw.*, no. 42, 20 pp., 23 figs. Berlin, August 1931.

The first part of this paper discusses the conditions that have to be fulfilled by the distributor of a dust insecticide to be applied from an aeroplane. A chapter by Hoffmann and Föttinger reports on a study of the air-currents recorded with a model aeroplane in a wind-tunnel, and on the forms of wind shields required to protect the stream of dust at the point of its delivery from the hopper. Dr. Kienitz describes a distributor for the dust [*R.A.E.*, A, xvii, 576] and the mechanism

for driving it, and H. E. Dechert, an air pilot, gives an account of the complete arrangement of hopper, distributor, drive, and dust shield, and his experiences of its working in the air.

Reckendorfer (P.). **Die Hydrolyse des Schweinfurtergrüns. Ein analytischer Beitrag zur Kenntnis der " wasserlöslichen " arsenigen Säure.** [The Hydrolysis of Paris Green. An analytical Contribution to the Knowledge of the " water-soluble " arsenious Acids.]—*Gartenbauwiss.*, v, no. 1, pp. 91–106, 3 figs. Berlin, 1931.

It has been shown that the continued hydrolysis of Paris green is the cause of injury to plants by arsenic [*R.A.E.*, A, xix, 587]. This paper describes a method by which the progress of this gradual hydrolysis can be closely followed by means of a series of analyses.

Parfentjev (J. A.) & Devrient (W.). **Ueber die Wirkung des Arsens auf den Gasstoffwechsel bei Insekten.** [On the Effect of Arsenic on the Respiratory Metabolism in Insects.]—*Biochem. Z.*, ccxvii, no. 4–6, pp. 368–377, 28 refs. Berlin, 1930.

A detailed account is given of experiments in which arsenical solutions, etc., were injected into the hind coxae of cockroaches, from the results of which the authors conclude that the toxicity of arsenicals to insects cannot be explained by their effect on the respiratory metabolism [*cf. R.A.E.*, A, xv, 183].

Cuscianna (N.). **La Cocciniglia del Susino** *Eulecanium corni* **(Bouché) in Provincia di Trieste. Note morfologiche e biografiche. Esperienze di lotta.** [The Plum Scale, *Lecanium corni*, in the Province of Trieste. Morphological and biological Notes. Experiments in Control.]—*Boll. Lab. Zool. Portici*, xxiv, pp. 279–298, 7 figs., 17 refs. Portici, 28th July 1931.

In the spring of 1929, plums in the province of Trieste were severely injured by *Lecanium* (*Eulecanium*) *corni*, Bch., which also occurs on apple there. All stages of this Coccid are described, with notes on its food-plants and geographical distribution. In the province of Trieste the overwintered larvae resume development in March, April or May, according to the mildness of the weather, and migrate to the young branches. The females require about a month to become mature, ovipositing in May or June. As regards the males, second stage larvae were still on the trees at the end of March (1930), pupae were present in April and early May, and adults emerged during May. The natural enemies observed included the Coccinellid, *Exochomus quadripustulatus*, L., and the parasites, *Encyrtus sylvius*, Dalm., *Coccophagus lycimnia*, Wlk., and *Aphycus punctipes*, Dalm., but they are of little practical value. A number of contact insecticides were tried, but no reliable data for comparison were obtained. It would appear, however, that caustic soda [*R.A.E.*, A, xvi, 655] and a mineral oil emulsion are worth further trial.

CANDURA (G. A.). **Prima serie di ricerche sperimentali per conoscere gli ospiti del** *Nosema bombycis* **Näg., che produce l'atrofia parassitaria o pebrina del baco da seta.** [First Series of experimental Investigations to ascertain the Hosts of *N. bombycis*, the causal Agent of Pebrine of the Silkworm.]—*Boll. R. Staz. sper. Gelsic. Bachic.*, x, no. 4, pp. 124–135. Ascoli Piceno, August 1931. Also in *Boll. Zool.*, ii, no. 5, pp. 209–216. Naples, October 1931.

Pebrine is responsible for serious losses among silkworms (*Bombyx mori*, L.) in Italy, and the determination of the vectors of the causal organism, *Nosema bombycis*, is important. The adults of *Dermestes vulpinus*, F., feed on the eggs, pupae and adults of *B. mori*, and *N. bombycis* was found in dead beetles that had fed on diseased silkworm eggs and moths and in their excreta. Further investigations are being made to find whether healthy silkworms can acquire infection from such sources.

SAVASTANO (L.). **Della biancarossa** (*Chrysomphalus dictyospermi* **Morg.) negli agrumi e in altre specie ospitanti nell'Italia. Studio di fitopatologia arborea.** [On *C. dictyospermi* infesting *Citrus* and other Plants in Italy. A Study of arboreal Phytopathology.]—*Ann. Staz. Agrum. Frutt. Acireale*, x, pp. 1–77, 8 pls., 31 refs. Acireale, 1930. [Recd. September 1931.]

This paper deals primarily and in detail with the relations between *Chrysomphalus dictyospermi*, Morg., and its food-plants, based on observations in Calabria and Sicily from 1910 to 1929. A list is given of the plants infested, divided into families attacked severely, moderately, and slightly. The manner in which they are attacked and the damage caused are discussed. Sections are also devoted to the history of the introduction of this scale into the Mediterranean basin, the present state of infestation by it, and its bionomics and natural enemies. Of the latter, those most frequently encountered on *Citrus* in Italy are *Chilocorus bipustulatus*, L., *Exochomus quadripustulatus*, L., *Lindorus* (*Rhizobius*) *lophanthae*, Blaisd., *Aphelinus chrysomphali*, Mercet, *Aspidiotiphagus* (*Prospaltella*) *lounsburyi*, Berl. & Paoli, and *A. citrinus*, Craw.

FRAENKEL (G.). **Die Orientierung von** *Schistocerca gregaria* **zu strahlender Wärme.** [The Orientation of *S. gregaria* to radiant Heat.]—*Z. vergl. Physiol.*, xiii, no. 2, pp. 300–313, 10 figs. Berlin, 1930.

It has been found in Palestine that the locust, *Schistocerca gregaria*, Forsk., regulates its body temperature by changing the position of its body, which is at right angles to the sun's rays at 20–27° C. [68–80·6° F.] and parallel to them at 40° C. [104° F.] [*R.A.E.*, A, xviii, 185]. Experiments, some carried out with blinded individuals, are described in detail and show that the reaction is due to heat rays rather than to light rays.

MORRIS (H. M.). **Cyprus: Locust Campaign, 1930 and 1931.**—*Int. Bull. Pl. Prot.*, v, no. 10, pp. M181–M182. Rome, October 1931.

In Cyprus, *Dociostaurus maroccanus*, Thunb., was more numerous in 1930 than in the previous year, but in 1931 the numbers again decreased. *Calliptamus italicus*, L., *Tettigonia viridissima*, L., and

Decticus albifrons, F., were abundant in some areas in 1930, the first-named also in 1931. Control measures included the purchase of locusts collected by hand nets and the use of poisoned bran baits.

DE BENEDICTIS (A.). **Eritrea : Desert Locusts** (*Schistocerca gregaria*).—*Int. Bull. Pl. Prot.*, v, no. 10, pp. M182–M183. Rome, October 1931.

In April 1931, swarms of *Schistocerca gregaria*, Forsk., entered Eritrea from Abyssinia, and in May they reached the eastern plain and mixed there with locally bred locusts. Throughout the month, numerous swarms circled over the Colony. Further swarms arrived in the first half of June from the Sudan and from beyond the Red Sea, and in the second half from Abyssinia. Egg-laying was not reported.

BAKÓ (G.). **Hungary : Locusts.**—*Int. Bull. Pl. Prot.*, v, no. 10, p. M187. Rome, October 1931.

The first signs of the influence of a series of dry years on the development of locusts began to be apparent in Hungary in 1930, when small swarms of *Calliptamus italicus*, L., were observed in several places, without, however, doing serious damage. *Dociostaurus maroccanus*, Thunb., also appeared in 1930 in five communes, and in 1931 both species occurred in great numbers, *D. maroccanus* invading 27 communes. Good control of the hoppers was obtained by means of machines fitted with wire brushes.

Other species of Orthoptera were also very numerous in 1931, particularly *Gryllus desertus*, Pall., and *Metrioptera* (*Platycleis*) *grisea*, F. These have been controlled in their breeding grounds, the former by arsenical sprays, the latter by tooth-harrows.

VAN DER MERWE (C. P.). *Aphis leguminosae.* **A biological Study.**—*Ent. Mem. Dept. Agric. S. Afr.*, no. 7, pp. 5–16, 1 fig. Pretoria, 1931.

An account is given of observations in Durban from June 1926 to July 1927 on *Aphis leguminosae*, Theo., the vector of rosette disease of ground-nuts [*Arachis hypogaea*] in South Africa. The Aphids were confined in small cages consisting of rings of about ¼ in. in thickness sawn from bamboo. The leaf is held between one ring and a disk of cork of about the same diameter. A second ring of the same size, the top of which is covered with muslin, is placed on the first one, and the whole held in position by means of a spring clip. The upper ring is removed for making observations. The alate and apterous viviparous females and an aberrant form of viviparous female with wing pads are described. No other forms were observed under natural conditions in Durban or experimentally. The activities and rate of development of the Aphids varied considerably according to climatic conditions. The winged forms matured in 6–16 days, and the wingless ones in 5–15. Apterous forms usually began to reproduce as soon as they matured, and alate ones 1–4 days afterwards. The periods of reproduction for alate and apterous forms averaged 9·5 and 9 days respectively in the summer, and 22 and 18·2 in the winter. The number of young produced varied considerably according to the time of the year and the condition of the food-plant, the rate of reproduction being much greater

on vigorous than on stunted plants and with well nourished wingless females than with small ones ; the average progeny for winged and wingless forms numbered 39 and 46 respectively. Experiments showed that winged forms were produced as a result of overcrowding and, to a less extent, of starvation. Observations show that a much larger proportion of the progeny of the apterous forms develop wings than of that of the alate ones. Aphids confined on leguminous plants other than ground-nuts did not thrive, and though they reproduced, the mortality of the progeny was high. Natural enemies included a Braconid, *Aphidius* sp., which was active even in the winter.

RIPLEY (L. B.) & HEPBURN (G. A.). **Non-arsenical Fruit-fly Poisons.**—*Ent. Mem. Dept. Agric. S. Afr.*, no. 7, pp. 17–23, 3 charts, 6 refs. Pretoria, 1931.

If used on *Citrus* and applied too freely, sweetened bait-sprays containing lead arsenate, applied to the foliage, have the disadvantage of reducing the acidity of the fruit [*cf. R.A.E.*, A, xvi, 306]. A number of non-arsenical stomach poisons were therefore tested against the Natal fruit-fly, *Ceratitis* (*Pterandrus*) *rosa*, Ksh. The laboratory technique is described.

The following is taken from the authors' summary : Sodium fluosilicate is promising as a poison for bait-sprays on *Citrus* foliage, having a toxicity to the Natal fruit-fly 16 times that of lead arsenate. It could be employed far more cheaply than the latter. Although preliminary trials showed no damage to *Citrus* foliage at concentrations sufficiently high to ensure adequate toxicity to the fly, further investigation is required to determine the effect upon the foliage and the flavour of the fruit. Barium fluosilicate and lead arsenate appear to be about equally toxic to the fly. As its toxicity to foliage is lower than that of the sodium salt, the former deserves further study, especially as an insecticide against *Argyroploce leucotreta*, Meyr. (false codling moth) and leaf-eating insects attacking *Citrus*, where heavy spraying may be required. Cryolite, calcium fluosilicate, copper carbonate, and pulvex (a derris product) are not sufficiently toxic to be useful as Natal fruit-fly poisons. Derrisol is highly toxic but somewhat too volatile for use in bait-sprays.

RIPLEY (L. B.) & HEPBURN (G. A.). **Further Studies on the olfactory Reactions of the Natal Fruit-fly,** *Pterandrus rosa* (**Ksh.**).—*Ent. Mem. Dept. Agric. S. Afr.*, no. 7, pp. 24–81, 6 figs., 29 refs. Pretoria, 1931.

The following is the authors' summary : New methods of studying the olfactory reactions of fruit-flies [*cf. R.A.E.*, A, xviii, 197, 421] are described. Some 350 pure compounds, essential oils and other substances have been tested for their olfactory effect upon *Ceratitis* (*Pterandrus*) *rosa*, Ksh., and the results are presented in the form of an incomplete table. The tested substances are classified as attractants, repellents and obscurants, and in many cases the intensity of the reaction caused has been numerically expressed. Of 86 attractants found, only 32 are strong enough to attract in the orchard. Nine of these affect males only, most of the others attracting the sexes about equally. Pollard bait is the strongest attractant known of those that attract both sexes. By its use in traps, infestation can be

materially reduced, but satisfactory control is not achieved, a stronger attractant being required. The principal attractive compounds in it (liberated as fermentation products) have thus far eluded detection. Caryophyllene (from clove oil) and terpinyl acetate are powerful male attractants, but until it be learned whether males of *C. rosa* mate more than once, the practical value of such male attractants must remain doubtful.

Twenty-seven true repellents have been discovered, of which paraffin and various nitrogenous decomposition products, such as amines, are particularly powerful. Preliminary field tests have given encouraging results with a repellent emulsion absorbed in wads of cotton waste and hung in the trees. Numerous chemicals that obscure attractive odours (obscurants) have been found, some of which repel while others attract. Several of the stronger obscurants are promising for use in control work, the method of application being the same as with repellents. Certain strong repellents act but weakly as obscurants, so cannot be expected to function efficiently in the presence of fruit odours. To be of practical value, the repellent must also be a strong obscurant. The olfactory sense of *C. rosa* is exceedingly well developed as regards both sensitiveness and range, most chemicals that affect the human sense being also detectable by the fly. Its olfactory sense differs decidedly from that of man, however, in respect of the relative intensity of different odours.

Products liberated by the fermentation of carbohydrates attract in general, whereas nitrogenous decomposition products generally repel. Aliphatic alcohols, aldehydes, esters, and acids of low carbon content in general attract. Alcohols of this series with more than eight carbon atoms repel. Similar laws probably apply to other compounds in this series. Theories have been suggested to explain these facts and to account for the attractiveness of clove oil ingredients to various species of fruit-flies. " Male attractants " are apparently of two types, some presumably simulating the odour of the female, whereas food-plant odours emanate from others. Many compounds, although bearing no known relation to the natural environment, stimulate definite reactions with *C. rosa* ; studies should therefore not be confined to chemicals to which the insect may reasonably be expected to react. Hibernating adults cannot be employed in studying the typical olfactory reactions for the species, as flies in this state do not react to odours in a normal manner.

KIRKPATRICK (T. W.). **Further Studies on Leaf-curl of Cotton in the Sudan.**—*Bull. Ent. Res.*, xxii, pt. 3, pp. 323–363, 2 pls., 1 diag., 23 refs. London, September 1931.

A very detailed account is given of further work on " leaf-curl" of cotton in the Sudan and its transmission by Aleurodids [*R.A.E.*, A, xviii, 634].

The following is taken from the author's summary : The literature is briefly reviewed, and the reasons for adopting the name " leaf-curl " are discussed. Up to the end of February 1931, 168 attempts had been made to transmit the disease from Sakel cotton (*Gossypium peruvianum* × *barbadense*) to Sakel cotton by means of Aleurodids (which have now been identified as *Bemisia gossypiperda*, Misra & Lamba [xvii, 703]), and of these, 157 were successful. No transmission was obtained with any other insects. The disease can be transmitted by

single individuals, but infection is less regular when one or only a few whiteflies are used. There is a large amount of negative evidence indicating that the virus is not transmitted through the seed. In nearly 200 controlled experiments the incubation period of the virus in the plant varied from 8–34 days, but more than two-thirds of the recorded periods were between 11 and 19 days. The possible causes of this variation are discussed. Of three strains of Sakel cotton selected for resistance to the disease, two at least showed a high degree of comparative resistance, and a greater tendency to recover than ordinary Sakel. Whiteflies can pick up the virus from parts of an infected Sakel plant that show no symptoms, but it is doubtful whether they can pick it up from infected plants before symptoms develop. Adults from larvae fed on infected plants can transmit the disease, but the virus cannot be inherited through the egg. Uninfected Aleurodids can pick up the virus in 3 hours or possibly less, and transmit it to healthy plants in 30 minutes ; the whole process of infection of the whiteflies and the healthy plant has been accomplished in 6½ hours. Leaf-curl can be transmitted from Sakel to *Hibiscus esculentus*, *H. cannabinus* and *H. sabdariffa*, but not from *H. esculentus* to Sakel unless it is first passed through *H. cannabinus*. It has also been observed on garden hollyhocks (*Althaea rosea*). When whiteflies from infected Sakel are transferred to American cotton of the variety Watts Long Staple (*G. hirsutum*), a conspicuous mosaic is regularly produced, but as a rule none of the ordinary symptoms of leaf-curling appear. Mosaic can be readily transferred from Watts Long Staple to other plants of the same variety, but when whiteflies are transferred from plants of Watts Long Staple infected with mosaic to healthy Sakel, no symptoms of either leaf-curling or mosaic are manifested. The virus must, however, be harboured in the plants in masked form since, when whiteflies are transferred from them back to Watts Long Staple, typical mosaic is produced. The symptoms of the disease in other varieties of cotton may be mixed ; some Asiatic varieties show no symptoms and do not apparently harbour the virus in a transmissible form.

During 1930–31, leaf-curl spread earlier and faster in the Gezira than during the previous season, and its general intensity was more severe. Apart from the selection of resistant strains of cotton, the only possibilities for its control are the destruction of Aleurodids or the removal of the initial sources of infection early in the season. It is believed that the virus is carried over from one season to the next mainly in the ratoon cotton plants that survive the " dead " season and produce new growth (which is almost always infected) when the land that has been under cotton is irrigated for other crops in August.

Lean (O. B.). **On the recent Swarming of** *Locusta migratorioides*, **R. & F.**—*Bull. Ent. Res.*, xxii, pt. 3, pp. 365–378, 9 maps, 21 refs. London, September 1931.

An analysis of information collected by the Imperial Institute of Entomology has enabled the author to outline the history of the recent outbreak of *Locusta migratoria migratorioides*, R. & F., in Africa. The first records of swarming refer to the San and Macina districts of the French Sudan, 200 miles up the river Niger from Timbuctoo, where unidentified hoppers were observed about June 1928. From there adult swarms gradually spread over West Africa in 1929, the main trend of the migration of successive generations being towards the east.

In the first half of 1930 breeding on a very large scale occurred in the Gambia, French Guinea, Sierra Leone, the Upper Volta, the Gold Coast, Niger, Dahomey, Nigeria and probably other parts of West Africa. During the second half of the same year, locusts reached the Anglo-Egyptian Sudan and the breeding area was probably continuous from Long. 3° W. to 36° E. Adult swarms of the following generation, bred in the Sudan, moved south into Uganda, Tanganyika and Kenya, touching also the Belgian Congo.

The band of country extending from the Gambia to the Nile valley in the Sudan and from there southwards that has been invaded by this locust corresponds roughly with three vegetation belts, *viz.*, "high grass—low tree savannah," "acacia—tall grass savannah," and "acacia—desert grass savannah." The flights in the main have avoided the tropical rain forests, and did not penetrate into the "desert shrub" belt. Breeding has occurred throughout the invaded areas, with a tendency for those adjoining rivers and lakes to be most heavily infested.

Thus, the outbreaks in West, Central and East Africa prove to be interrelated, and have probably originated in one, or at most two, permanent breeding grounds. The area most likely to be concerned is the lake district of the middle Niger, where conditions seem to be suitable for the formation of the swarming phase. A study of the variations in the water regime of the river may provide a key to the problem of the beginning of the outbreak. Lake Chad is probably a secondary, rather than a permanent breeding ground. It is possible that some areas of the Upper Nile and Senegal rivers may represent breeding grounds, but the available evidence is not sufficient.

The locust appears to have two breeding seasons a year. The first commences with the first rains and the second towards the end of the wet season, the adults appearing after the last rains. The adult generation living during the dry season lasts for a longer time, so that this apparently causes an adult diapause.

The adult locusts feed almost entirely on graminaceous plants, the principal crops concerned being maize, *Sorghum*, rice and sugar-cane. During the dry season they occasionally attack coconut, oil palms [*Elaeis guineënsis*], banana, pineapple, sisal, etc., in search of water rather than of food. The diet of the hoppers is similar; they also occasionally feed on ground-nuts [*Arachis hypogaea*].

A brief summary of previous outbreaks of *L. migratoria migratorioides* in Africa is included.

Johnston (H. B.) & Maxwell-Darling (R. C.). **On the Occurrence in the Sudan of** *Locusta migratorioides*, **Rch. & Frm., and its associated Phases.**—*Bull. Ent. Res.*, xxii, pt. 3, pp. 399–416, 6 refs. London, September 1931.

During July and August 1930, the Anglo-Egyptian Sudan was invaded by swarms of *Locusta migratoria migratorioides*, R. & F., which came from the west and south-west. The eggs were laid over a large area, and the authors took the opportunity of studying the phase transformations and bionomics of this locust under Sudan conditions.

The solitary phase is widely distributed in the Sudan, particularly in the vicinity of cultivation. The annual cycle is not fully known, but probably only one, with possibly a partial second, generation is produced. During the rainy season, the larvae of this phase may be

occasionally found among tufted grasses. Under favourable conditions, such as are provided by prolonged heavy rainfall and consequent abundant food, these solitary hoppers may begin to collect into small bands and then transform into the phase *congregans*. If the climatic conditions approximate to the optimum, further transformation towards the phase *gregaria* may take place. When bands of hoppers in the field were broken up by poisoning operations, a transition to the phase *dissocians* was observed.

Hoppers and adults of all phases are described, and measurements of them given. Breeding experiments confirmed the current views as to density being the main factor of transformation, though a completely typical *gregaria* phase, as represented in invading swarms, was never obtained experimentally.

Repeated egg-laying by individual females was observed in cages, and is almost certain to occur in nature. Eggs are laid in both light and heavy soils, females in cages showing a slight preference for the former. The average incubation period varies from about 12 to 22 days, according to the season. The percentage of eggs hatching in soil that was allowed to dry out was only 24, as compared with 95 in soil prevented from drying. Hoppers feed exclusively on graminaceous plants, and attempts to breed them on cotton, *Dolichos lablab* and *Ipomoea* all failed.

YAKHONTOV (V. V.). **The Pseudopupa and the last larval Instar of** *Epicauta erythrocephala*, **Pall.** (**Col. Meloidae**).—*Bull. Ent. Res.*, xxii, pt. 3, pp. 379–382, 4 figs., 4 refs. London, September 1931.

Descriptions are given of the pseudopupa and last larval instar of *Epicauta erythrocephala*, Pall., taken in the vicinity of Old Bokhara. These stages have not previously been described, and the figures given by Porchinskiĭ in a paper already noticed [*R.A.E.*, A, ii, 473] are stated to be incorrect. This beetle is an important pest of many cultivated plants, and its larva is a parasite of locust egg-pods.

[YAZUIKOV] JAZYKOV (ZAKHVATKIN) (A. A.). **Parasites and Hyperparasites of the Egg-pods of injurious Locusts** (**Acridodea**) **of Turkestan.**—*Bull. Ent. Res.*, xxii, pt. 3, pp. 385–391. London, September 1931.

This is a summary of part of an extensive Russian report on parasites of the egg-pods of 9 injurious species of locusts in Turkestan studied in 1927–30, and deals with the Meloids, *Epicauta erythrocephala*, Pall., *Mylabris frolovi*, Germ., *M. deserta*, Sum., *M. tekkensis*, Heyd., *M. scabiosae*, Ol., *M. quadripunctata*, L., *M. atrata*, Pall., and *M. biguttata*, Gebl.; two Clerids of the genus *Trichodes*, of which one was probably *T. turkestanicus*, Kraatz, and the other *T. spectabilis*, Kraatz; the Bombyliids, *Callostoma desertorum*, Lw., *Cytherea setosa*, Par., a variety of *Anastoechus nitidulus*, F., *A. baigakumensis*, Par., *Anthrax monachus*, Sack., and three other species, which will be described by Paramonov; the Tachinids, *Oophagomyia plotnikovi*, Rohd., and *Stomatorrhina lunata*, F.; and the Scelionid, *Scelio nikolskyi*, Ogl. In some cases notes are given on the bionomics of the parasites, and a list of the species of locusts with their respective parasites is included. The view that *Mylabris atrata* and *M. biguttata* are varieties of *M. polymorpha*, Pall., is incorrect, as the primary larvae of these species are very distinct.

Wilkinson (D. S.). **Four new Species of Ichneumonoidea.**—*Bull. Ent. Res.*, xxii, pt. 3, pp. 393–397. London, September 1931.

The new species described are: *Glypta leucotretae*, reared from *Argyroploce leucotreta*, Meyr., in Southern Rhodesia; *Mesobracon psolopterus*, from a coffee branch borer in Sierra Leone; *Camptothlipsis furtifica*, from the Tineid, *Dichomeris evidantis*, Meyr., defoliating *Dalbergia sissoo* in the Punjab; and *C. antigastrae*, from the Pyralid, *Antigastra catalaunalis*, Dup., in the Anglo-Egyptian Sudan. A key is given to the four species of *Camptothlipsis*. *Apanteles taragamae*, Vier., is recorded from the Pyralid, *Margaronia indica*, Saund., on cucurbits in Ceylon.

Marshall (Sir G. A. K.). **New injurious Curculionidae (Col.).**—*Bull. Ent. Res.*, xxii, pt. 3, pp. 417–421, 1 pl. London, September 1931.

The new species described are *Aedophronus echinatus*, the adults of which were found feeding on young shoots of newly planted almond trees, and *Mimaulus sulcatifrons* on cotton and tobacco, both in the Transvaal; *Lalagetes leurops* on grape vines in Cape Province; *Catoptes instabilis* (with var. n. *vittiger*) and *C. fraudator* on turnips, and *C. postrectus* on mangels, in New Zealand; and *Diaphna nociva*, on pines in Cape Province, where the larvae cause serious damage by boring under the bark and partly into the wood.

Buxton (P. A.). **The Measurement and Control of atmospheric Humidity in Relation to entomological Problems.**—*Bull. Ent. Res.*, xxii, pt. 3, pp. 431–447, 9 figs., 23 refs. London, September 1931.

It is generally agreed that atmospheric humidity is often of great importance in limiting the times or places at which insects are abundant, but although information on water relations and water balance may lead to greatly increased knowledge of insects, an understanding of these matters has been delayed owing to lack of information on appropriate methods for measuring and controlling this factor. For this reason the author describes a number of practical methods, which may be of service to workers even in remote countries, including material already known to physicists, and other devices that can be used in small spaces and are portable. For the convenience of workers who have not access to libraries and collections of tabulated facts, a certain amount of information that is available in meteorological and physical tables has been included in graphic form. Types of apparatus of which descriptions are readily available have been omitted.

Morgan (W. L.). **Insect Pests of Vegetables. A Chart of Control Measures.**—*Agric. Gaz. N.S.W.*, xlii, pt. 8, pp. 610–618. Sydney, 1st August 1931.

The pests of vegetable crops in New South Wales are listed in a table, which indicates the correct methods of treatment for each and the times for their application.

Uchida (T.). **Beitrag zur Kenntnis der Cryptinenfauna Formosas.** [Contribution to the Knowledge of the Cryptine Fauna of Formosa.]—*J. Fac. Agric. Hokkaido Imp. Univ.*, xxx, pt. 3, pp. 163–193, 1 pl., 15 figs. Sapporo, September 1931.

Among the species described is *Gambrus rufithorax*, sp. n., parasitising *Diatraea venosata*, Wlk., and *Chilo infuscatellus*, Snell. *Cryptus trirrhogmaniformis*, Sonan [*R.A.E.*, A, xviii, 8] is a synonym of *Cryptaulax coreanus*, Szép., which, in Korea, is a parasite of *Cnidocampa flavescens*, Wlk.

Ijima (K.). **The Life-history of** *Trichiocampus* **sp. injurious to Cherry.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi*, iii, pp. 188–190. Tokyo, 1931.

A sawfly, *Trichiocampus* sp., which feeds on cherry leaves in Japan, has 5 generations a year, hibernation taking place in the larval stage in cocoons. It reaches its greatest numbers in the second generation, the third and fourth being the smallest. The egg, larval and pupal stages last 6–9, 15–22 and 6 days, respectively, except in the case of overwintering larvae, the pupal stage of which lasts 13–17 days. The pupae are found in sheltered places and in crevices on the food-plants. Pairing and oviposition may begin on the day of emergence. Females may live up to 14 days and lay as many as 100 eggs, the average being 30. They are deposited singly on the midribs of the leaves; unfertilised eggs always produce males.

Narutomi (N.). **On the Life-histories of** *Athalia* **spp.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi*, iii, pp. 190–192. Tokyo, 1931.

Athalia colibri var. *japonensis*, Rohw., *A. japonica*, Klug, and *A. lugens* var. *infumata*, Marlatt, which have 2 or 3 generations a year, feed on crucifers in Japan. They hibernate as larvae in cocoons, pupating in April, and the adults emerge in 5–9 days. The eggs are laid singly in the tissues of the plants and hatch in 8–16 days. The larval stage lasts 9–18 days in summer. Observations on the varying number of larval moults in these sawflies are included.

Ninomiya (E.). **The Life-history of** *Sphaerophoria cylindrica*, **Say.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi*, iii, pp. 216–221, 9 figs. Tokyo, 1931.

The larvae of the Syrphid, *Sphaerophoria cylindrica*, Say, feed on various Aphids in Japan. The egg stage lasts about 4 days, the larval 15–20 and the pupal 15–22. The larvae are parasitised by the Ichneumonid, *Bassus laetatorius*, F., and a Figitine Cynipid.

Yuasa (H.). **The Life-history of** *Metriona thais*, **Boh.** [*In Japanese.*]—*Oyo-Dobuts. Zasshi*, iii, pp. 221–223. Tokyo, 1931.

An account is given of the bionomics of the Cassidid, *Metriona thais*, Boh., which feeds on the leaves of apple in Japan, but is not of economic importance there. There appears to be one generation a year, the overwintered adults beginning to be active about the middle of May. The egg, larval and pupal stages last 6–14, 21–49 and 5–9 days respectively. In captivity the larvae also feed on cherry, pear and peach leaves.

Kamito (S.) & Sakai (K.). **On the Seasonal History and Habits of** *Bruchus rufimanus*. [*In Japanese.*]—*Oyo-Dobuts. Zasshi*, iii, p. 223. Tokyo, 1931.

Bruchus rufimanus, Boh., has one generation a year near Tokyo. The beetles, which live on an average for 34 days when fed on honey, begin to be active from March onwards [*cf. R.A.E.*, A, xviii, 615]. Mating does not take place below 17° C. [62·6° F.], and oviposition usually occurs above 20° C. [68° F.]. The eggs, which are to be found from the beginning of May to the middle of June, are laid on the pods of the beans, one female laying 40 eggs. The larvae hatch in about 11 days and occur from May to September, the larval stage occupying on an average 75 days. The pupal stage lasts about 6 days.

Summerville (W. A. T.). **The Control of the Bronze Orange Bug.**—*Queensland Agric. J.*, xxxvi, pt. 2, pp. 138–140. Brisbane, 1st August 1931.

As a result of experiments in Queensland to determine a more efficient method of controlling *Rhoecocoris* (*Oncoscelis*) *sulciventris*, Stål (bronze orange bug) on *Citrus*, a spray has been evolved that has given 94·64 per cent. mortality. The stock solution, which should be used at a dilution of 1 : 19, is prepared by boiling a mixture of 10 lb. finely ground resin and 3 lb. caustic soda of good quality in 2 gals. water until a clear dark solution is obtained (about 2 hours is required and occasional stirring is necessary) and adding 1½ lb. fish oil, the whole being boiled for a few minutes to ensure emulsification of the oil. It is advisable to draw on the stock only while it is hot as there is a deposition of solid on cooling. The spray has excellent spreading qualities, and no injury has resulted from its use except in very hot weather. It is most effective against nymphs in the second or hibernating instar and should be thoroughly applied as soon as possible after this stage is reached, which in normal years will be towards the end of March or early in April.

Weddell (J. A.). **Experiments with the Heat Treatment of Fly-infested Fruit.**—*Queensland Agric. J.*, xxxvi, pt. 2, pp. 141–147. Brisbane, 1st August 1931.

Experiments were carried out in 1931 to determine whether the heat treatment of fruit as practised in Florida against *Ceratitis capitata*, Wied. [*R.A.E.*, A, xviii, 22, 547] would be applicable under Queensland conditions and to fruits other than *Citrus* that are infested with *Dacus ferrugineus*, F. (*Chaetodacus tryoni*, Frogg.) (Queensland fruit fly). It was proved that exposure to temperatures between 110 and 115° F. at approximately 100 per cent. relative humidity for 8 hours would kill the larvae in apples, oranges, peaches, pears and persimmons. These conditions also proved fatal to the codling moth [*Cydia pomonella*, L.]. No proof was obtained that eggs were killed in oranges and grapefruit, owing to the failure of those in the control fruit to hatch. A number of apples were apparently affected by treatment, for after about 5 days they became soft, watery and loose-skinned. The keeping qualities of peaches, pears and persimmons were not ascertained, since uninfested fruit was not subjected to treatment. The flavour of the *Citrus* fruit was not affected.

As *D. ferrugineus* is present throughout the fruit-growing areas of Queensland, the adoption of this treatment would involve the establishment of plant in numerous centres with heavy capital expenditure, and could not at present be justified. It might become worthy of consideration if a large extension of export trade occurred, particularly in *Citrus* fruit. Some modification in the method would be necessary for the treatment of deciduous fruits.

SMITH (J. H.). **Tobacco Pests.**—*Queensland Agric. J.*, xxxvi, pt. 2, pp. 195–212, 6 pls. Brisbane, 1st August 1931.

In view of the increase of tobacco growing in Queensland during the past two years, the author records the bionomics and an outline for the control of various pests of this crop. The principal insects dealt with are wireworms, cutworms, *Dasus* (*Gonocephalum*) sp., *Heliothis obsoleta*, F., and *Phthorimaea operculella*, Zell.

Control of Red-pumpkin Beetle (*Aulacophora abdominalis*).—*Leafl. Dept. Agric. Bombay*, no. 9 (1930), 2 pp., 1 pl. Bombay, 1930. [Recd. October 1931.]

In Bombay, *Rhaphidopalpa* (*Aulacophora*) *abdominalis*, F., is a more or less constant pest that becomes sporadically serious on young tender shoots, leaves and flowers of various cucurbits. The beetles appear about the middle of March and continue to be injurious until October, when they go into hibernation in the soil. The adults are responsible for all damage above ground. The eggs are laid singly or in batches in the soil about the roots of cucurbits, at short intervals extending over a period of 3–4 weeks. One female lays, on an average, more than 150 eggs, the maximum in the laboratory being 295. They are deposited preferably in wet soil, and usually during the night. The larvae, which hatch in 6–15 days according to temperature and humidity, move actively in the soil and feed on the roots and stems, into which they bore. Fallen fruits and leaves lying on the ground are sometimes attacked from the side in contact with the soil. After 2–3 weeks, pupation takes place deeper in the soil, and the adult emerges 7–17 days later. The whole life-cycle thus occupies 4–7 weeks, and there are 3–5 generations during the year.

Control measures recommended include destruction of crop remnants, thorough ploughing, clod crushing and harrowing to destroy the larvae and pupae, and collection of the adults. Repellents suggested for use against the adults are dusts consisting of 2 lb. wood or cowdung ashes and 4–8 oz. kerosene, or 30–40 lb. fine road dust with 5 lb. kerosene, 3–5 lb. ashes and 1 lb. fine tobacco dust or snuff. A mixture of Paris green or lead arsenate (1 : 20 or 1 : 30) dusted over the affected crop as a stomach poison against the adults gave very satisfactory results, and a spray of 3 oz. lead arsenate, 1 lb. jaggery and 4 gals. water is also recommended.

COLEMAN (L. C.). **Report on the Coffee Berry Borer,** *Stephanoderes hampei*, **Ferr., in Java.**—*Bull. Dept. Agric. Mysore*, Gen. Ser. no. 16, 26 pp., 5 pls., 4 refs. Bangalore, 1931.

The author gives an account of the results of a brief visit to Java to enquire into the conditions influencing the prevalence of *Stephanoderes*

hampei, Ferr., and the control measures used in that country [*R.A.E.*, A, xii, 202; xiv, 438; xix, 193]. His visit was made in view of the supposed introduction of this Scolytid into South India [xviii, 364, 705], but it is now doubtful whether it actually occurs there. Beetles of the genus *Stephanoderes* have been obtained from coffee beans and coffee berries on estates in South India, but none has been definitely identified as *S. hampei*. Moreover, all specimens so far submitted to A. C. Eggers have been found to be *S. uniseriatus*, Egg. Other pests and diseases of coffee in Java are briefly discussed.

A note on the situation in India by K. Kunhi Kannan is appended (pp. 21–22), in which it is stated that examinations of young coffee berries on estates in which infestation was suspected yielded no evidence of the pest. Only one beetle was found, which is a species of *Stephanoderes*, but whether it is *S. hampei* has not yet been determined. Subsequently three species of beetle were found on examination of dry coffee berries observed on the bushes at the close of the monsoon; one of these was a species of *Stephanoderes*, but none has yet been observed to bore into the beans themselves. Work is however proceeding on the assumption that *S. hampei* is present in South India.

Lopez (A. W.). **The Fly** *Eutrixopsis javana* **Townsend (Diptera, Tachinidae), a Parasite of the Beetle** *Leucopholis irrorata* **in Occidental Negros, Philippine Islands.**—*Philipp. J. Sci.*, xlvi, no. 1, p. 129, 2 refs. Manila, September 1931.

In April 1930, four larvae of the Tachinid, *Eutrixopsis javana*, Tns., were found in a single individual of the Melolonthid, *Leucopholis irrorata*, Chevr., which is the worst pest of the roots of sugar-cane in the Philippines [*cf. R.A.E.*, A, xix, 574]. The parasites pupated on 11th April and emerged on 20th April.

Eddy (C. O.) & Livingstone (E. M.). *Frankliniella fusca* **Hinds (Thrips) on Seedling Cotton.**—*Bull. S. Carolina Agric. Expt. Sta.*, no. 271, 23 pp., 4 figs., 17 refs. Clemson College, S.C., March 1931.

Experiments in South Carolina in 1929 proved that infestation by thrips, *Frankliniella fusca*, Hinds, is capable of causing malformation and retardation of cotton seedlings, though it is difficult to determine the extent of damage in the field. Two forms occur in both sexes; in one the wings extend approximately to the end of the abdomen and in the other barely to the first abdominal segment, being mere wing pads. By selection five generations were necessary to segregate the short-winged form; though the long-winged one was reared through seven generations, it was never completely segregated. Fertilised eggs produced females and unfertilised ones males. Females laid about 30 eggs in 30 days. The incubation period averaged about 6 days, and subsequent development 10.

F. fusca hibernates as an adult female in and around the roots or base of grasses and weeds where the winters are severe, and on various green plants where they are mild. Available records show that it occurs from Massachusetts, New York and South Dakota in the north to eastern Texas and northern Florida in the south. It is also found

in Colorado and Utah. The plants principally attacked at Clemson College are grasses, cotton and onions, tobacco being a major food-plant where it is grown. A list is given of the other food-plants occurring in South Carolina, which include various vegetable and field crops.

Clean cultivation in and around the cotton fields should be practised, especially in the spring and autumn. Though frequent applications of contact sprays will control *F. fusca*, they cannot be used economically on cotton seedlings.

GROSSMAN (E. F.). **Biology of the Mexican Cotton Boll Weevil. VII: The Boll Weevil in artificial Hibernation Quarters.**—*Florida Ent.*, xv, no. 2, pp. 21–27, 1 fig., 2 refs. Gainesville, Fla., August 1931.

A new type of cage is described in which various factors influencing hibernation of *Anthonomus grandis*, Boh. (cotton boll weevil) could be observed. It was found that the weevils were negatively geotropic when seeking hibernation quarters, and it was probably this influence that caused the majority to choose the uppermost of a series of horizontal tubes containing Spanish moss in the cages. Moisture also seems to attract the weevils, so much so that in Florida it has been necessary to move cotton plantings away from areas near ponds and containing trees bearing Spanish moss, as the weevils hibernated there very successfully and reappeared in such numbers that cotton could not be produced economically. Hibernation of the weevils in cages exposed to varying temperature and relative humidity appears to be as successful as in cages kept at constant optimum temperature and relative humidity.

MILLER (R. L.). **A Contribution to the Life History and Habits of the Celery Leaf Tyer** *Phlyctaenia rubigalis* **Guenée in Florida.**—*Florida Ent.*, xv, no. 2, pp. 28–34. Gainesville, Fla., August 1931.

Phlyctaenia rubigalis, Gn., has been very destruetive to celery in Florida for many years. A study of its seasonal occurrence on various plants is recorded in tables. The larvae can be found on some 60 or 70 food-plants, on any of which the insect can live throughout the summer. During the growing season for celery, the number of moths increases more than 200 times in five months, but where there is not a continuous supply of growing celery the reduction in numbers is considerable. When the celery is all cut in late spring, the moths migrate to any succulent plants growing in damp, cool, shaded places ; rearing experiments showed that about 80 per cent. humidity is the most favourable for development and rapid reproduction. During the time when celery fields are not irrigated and before the summer rains begin, the number of insects along the beaten paths becomes greatly reduced, and by 15th June scarcely any can be found, though a few generally remain in swampy places. Only one generation is able to develop on one plant, which, owing to the larval injury, soon becomes hard and unfit for feeding. For this reason, not more than one generation was spent in one place, except on cultivated crops where development was continuous. In the rearing experiments, from 7 to 9 generations were obtained from December 1928 to December 1929.

Newcomer (E. J.) & Yothers (M. A.). **Experiments for the Control of the San José Scale with Lubricating-oil Emulsions in the Pacific Northwest.**—*Circ. U.S. Dept. Agric.*, no. 175, 12 pp., 1 fig., 7 refs. Washington, D.C., September 1931.

An account is given of experiments with lubricating oil emulsions conducted in Washington against *Aspidiotus perniciosus*, Comst., on fruit trees during 1923–25 and 1927. The following is taken from the authors' summary : The chief advantages of lubricating oil emulsions over lime-sulphur, when used against *A. perniciosus*, are that they are cheaper, easier to apply, and more effective against other pests. The danger of injury to dormant trees from oil sprays, if properly made, is very slight. They must be used in the spring before the bud scales separate, since injury may result if they are used at a later date, but no damage has resulted from low temperatures following sprays applied in spring. In the Pacific Northwest, sprays containing 4 per cent. oil allow only a fraction of 1 per cent. of the scale to live, and complete mortality may be obtained with 6 and 8 per cent. oil. It is probable that 3 per cent. would be effective if the infestation were very light, but 2 per cent. does not give satisfactory control. When used at 3 per cent. there is practically no difference in the effectiveness of oils of the red engine and of the brown neutral types, even though the latter are lighter. Oils with a sulphonation test of 50–70 per cent. may be used safely.

The three types of oil sprays tested (cold-mixed casein emulsion, boiled soap emulsion, and miscible oil) gave similar results. The boiled emulsion is readily broken down in hard water and cannot be recommended unless soft water is available. The addition of casein spreader to the diluted caseinate emulsion apparently does not influence its effectiveness against the scale, but the addition of weak lime-sulphur increases its toxicity, a complete mortality resulting from a 2 or 3 per cent. oil spray to which this has been added. This combination should be used only on dormant trees, since it is likely to scorch foliage. An oil emulsion containing coconut fatty acid (a commercial mixture containing crude lauric acid and known as double distilled coconut fatty acid was used) is also evidently more toxic than one without. It is prepared as follows : 9 oz. commercial caustic potash is dissolved in 2 U.S. gals. water, $2\frac{3}{4}$ lb. fatty acid is melted and poured into the caustic solution, 2 U.S. gals. oil is added and the mixture heated to the boiling point, when it is removed from the fire and $2\frac{1}{2}$ U.S. pints kerosene added. The mixture is then pumped twice to emulsify it.

Bentley (G. M.) & Bartlett (I. L.). **Insects and allied Pests of Greenhouse Plants with Recommendations for their Control.**—*Bull. Div. Plant Dis. Control Tennessee*, no. 57, 70 pp., 18 figs., 20 refs. Nashville, Tenn., March 1931.

The first 24 pages of this bulletin on insect and other pests of greenhouse plants in Tennessee are devoted to a discussion of the preparation and use of contact insecticides, stomach poisons and fumigants and methods of soil sterilisation. The remainder is an account of the individual pests and comprises brief notes on their bionomics and control.

Alexander (L. J.) & Young (H. C.). **Control of Powdery Mildew and Red Spider on Greenhouse Cucumbers.**—*Science*, lxxiv, no. 1917, pp. 314–315, 2 refs. New York, N.Y., 25th September 1931.

Tests, carried out in Ohio with sprays of various strengths of hydrophilic colloidal sulphur, showed that both powdery mildew and *Tetranychus telarius*, L., can be successfully controlled on cucumbers in greenhouses by a spray of 2 lb. of the paste to 100 U.S. gals. water without injury to the leaves. This treatment costs about the same as lime-sulphur and considerably less than nicotine sulphate.

Ancona H. (L.). **Los chilocuiles o gusanitos de la sal de Oaxaca.** [The Larvae of *Hypopta agavis* in the Mexican State of Oaxaca.]—*An. Inst. Biol. Univ. Mexico,* ii, no. 3, pp. 265–277, 14 figs., 5 refs. Mexico, 1931.

A detailed description is given of the larva of the Cossid, *Hypopta agavis*, Blazquez, which bores in the roots of *Agave* in Mexico [*R.A.E.*, A, xv, 494]. Paradichlorobenzene has been found too costly for use as a soil fumigant, but the egg batches may be collected early in the year or sprayed with kerosene emulsion. Possibly carbon bisulphide, applied to the root-collar, might prove of value.

Madariaga (A.). **Plagas de insectos mas frecuentes en la agricultura.** [The commonest Insect Pests of Agriculture in Mexico.]—*An. Inst. Biol. Univ. Mexico*, ii, no. 2, pp. 279–289. Mexico, 1931.

This list records in tabular form the scientific and popular names of 142 pests, with the food-plants and in some cases the means of control or natural enemies, of which only the popular names are given.

Principales plagas y enfermedades de los cultivos en la República Mexicana incluyendo las más importantes de los Estados Unidos de Norteamérica. [The chief Pests and Diseases of cultivated Plants in the Mexican Republic, including the most important ones in the United States.]—Med. 8vo., 378 pp., 100 figs., 54 pp. refs. Tacubaya, D.F., Sec. Agric. y Fomento, Mexico, 1931.

In this work, which is largely compiled from material from the United States, the pests and diseases are classified according to the plants concerned. In each case a brief account is given of the pest and of its control. A section deals with the various insecticides, and a bibliography of 54 pages (the first issued in Mexico relating to plant-defence work) and a subject index are included.

Duran (A. C.). **Estudio sobre el gusano " angosta "** (*Heliophila unipuncta*). [A Study on the Cutworm, *Cirphis unipuncta*.]—*Bol. Agric. y Caminos Guatemala*, x, no. 6, pp. 226–232. Guatemala, June 1931.

This article was prepared owing to the abundance of *Cirphis* (*Heliophila*) *unipuncta*, Haw., on maize seedlings in Guatemala and deals briefly with its classification, life-history and control. It is recommended that the measure adopted locally of dusting with calcium arsenate and lime (1 : 7), the dust being shaken from bags, should be continued and that light traps should be used for catching the moths.

Tucker (R. W. E.). **Report of the Entomologist.**—*Rep. Dept. Sci. Agric. Barbados 1930–31*, pp. 80–97, 10 pls., 1 map, 64 refs. [Bridgetown] 1931.

Mass rearing and liberation of *Trichogramma minutum*, Riley, in Barbados for the control of *Diatraea saccharalis*, F., on sugar-cane has proceeded since the last report [*R.A.E.*, A, xix, 172], and this work is now considered to be on an economic basis. Examples are quoted to show that the mass breeding of *T. minutum* on an increased scale is justified by results, not only in Barbados, but also in various other parts of the world. It is considered that greater success would be obtained if care were taken to liberate parasites only in fields containing freshly deposited eggs of *D. saccharalis*. Although a number of larval parasites have been introduced from British Guiana, none has become established ; it is hoped to repeat the introduction of *Lixophaga diatraeae*, Towns., from Cuba, with a view to establishing it on the larvae in the young cane crop before the peak production of *Trichogramma* is reached. The author considers that of all methods available for attempting the control of *D. saccharalis*, that of mass rearing of this parasite offers the greatest chance of success, and he explains in great detail the situation with regard to infestation by *D. saccharalis* before its introduction and the diminution in losses from this pest after its establishment, with notes on the breeding technique and the difficulties encountered in mass breeding. During 1929, a total of nearly 23 million parasites were liberated [xix, 105] ; in 1930 the liberations amounted to nearly 37 million.

Against *Diaprepes abbreviatus*, L. (cane root borer), *Tetrastichus haitiensis*, Gahan, an egg-parasite of allied weevils [xvii, 279 ; xix, 627] is to be introduced from Haiti, as there is no natural parasite in Barbados. During the year, collections of the beetle amounted to 1,315,200 ; its distribution and prevalence are shown in a map. The areas infested are the coastal ones of low rainfall, and it would appear that the average moisture content of the soil is a limiting factor in the spread of the pest. *Metamasius sericeus*, Ol. (cane weevil borer) is widely distributed over the Island, but is essentially a pest of cut or damaged canes. If rotten or damaged canes are removed from the field and stumps not intended for ratooning cut up and destroyed, this pest will be destroyed as well as numbers of *Diatraea* and *Diaprepes*.

The control measures practised against *Platyedra* (*Pectinophora*) *gossypiella*, Saund. (pink bollworm) continue to keep it in check [*cf.* xviii, 469 ; xix, 172] ; a few individuals only were found in February. The army worm, *Xylomyges eridania*, Cram., and, to a less extent, defoliators such as *Alabama argillacea*, Hb., and *Anomis* (*Aletia*) *luridula*, Gn., were present in enormous numbers on cotton in December 1930 and January 1931. The army worms invaded fields of sweet potato and devoured weeds, grasses and even cowpea bushes. On sweet potatoes, a dust of 1 part Paris green to 6 or 8 parts lime and hand crushing of the larvae when clustered under the vines were the most effective methods of control. It is hoped to introduce the Tachinid, *Compsilura concinnata*, Mg., from the United States to control some of the numerous Lepidopterous larvae that are pests in Barbados.

Adults of *Euscepes batatae*, Waterh. (sweet potato weevil) were kept alive without food or water for 45 days, and generations were reared on very small quantities of food, which emphasises its power of surviving to infest successive crops. The moisture content of the soil

is a considerable factor in limiting the extent of, or even preventing, attack ; both this and the varying susceptibility of different varieties of sweet potato will be further investigated.

BLÖTE (H. C.). **Catalogue of the Pyrrhocoridae in the 's Rijks Museum van natuurlijke Historie.**—*Zool. Meded.*, xiv, pt. 1–2, pp. 97–136, 6 figs. Leiden, 31st August 1931.

Among the species of *Dysdercus* dealt with, twelve are described as new, together with several varieties. The author's views differ from those of Hussey [*R.A.E.*, A, xviii, 108] in the following points of synonymy : *D. howardi*, Ballou, is a synonym of *D. fulvoniger*, DeG., *D. howardi* var. *minor*, Ballou, of *D. maurus*, Dist., and *D. simplex*, Wlk., of *D. crucifer*, Stål. Hussey considered that *D. howardi* var. *minor* and *D. fulvoniger* were synonyms of *D. ruficollis*, L. The identity of *D. cingulatus*, F., is discussed ; *D. megalopygus*, Bredd., is considered a synonym of it, but not *D. sidae*, Montr., as supposed by Hussey.

MEYRICK (E.). **Exotic Microlepidoptera, iv, pt. 6.**—pp. 161–192. Marlborough, Wilts, the author, November 1931. Price 3*s*. per part.

Among the new species described are the Tineids, *Bucculatrix ruficoma*, bred from sweet potato in Uganda, *Decadarchis scorpiura*, from fruits of oil palm (*Elaeis guineënsis*) and decaying flowers of coconut (*Cocos nucifera*) in Malaya, *D. melanostropha*, from *Thespesia populnea* in Bombay, *Lithocolletis iochrysis*, from *Zizyphus jujuba* in Bihar, *Acrocercops irradians*, from ginger (*Zingiber officinale*) in Bombay and also recorded from Formosa, *Stathmopoda conioma*, the larva of which was found feeding on *Pseudococcus* on coffee in Java, *Blastobasis chloroptris*, from coffee in Malaya, and *Hemerophila* (*Simaëthis*) *melophaga*, from leaves of apple in the North West Frontier Province, India.

PEARMAN (J. V.). **New Species of Psocoptera from Warehouses.**—*Ent. Mon. Mag.*, lxv, no. 5, pp. 104–109, 3 figs. **A new Species of** *Lepinotus* (**Psocoptera**).—*Op. cit.*, lxvii, no. 2, pp. 47–50, 4 figs. **More Psocoptera from Warehouses.**—*T.c.*, no. 4, pp. 95–98, 2 figs. London, May 1929, and February & April 1931.

Notes are given on the following species of Psocoptera taken in England : *Chaetopsocus richardsi*, gen. et sp. n., *Liposcelis virgulatus*, sp. n., *L. divinatorius*, Müll., *Stenotroctes minor*, sp. n., *Psoquilla, marginepunctata*, Hag., and *Deipnopsocus speciophilus* var. *disparilis*, n., found in West African cacao ; *Rhyopsocopsis peregrinus*, gen. et sp. n., in a banana store ; and *Lepinotus patruelis*, sp. n., in jars containing dried willow leaves and subsequently in fig vaults in a dried fruit warehouse.

Insect Pests and Fungus Diseases of Basket Willows.—*Bull. Minist. Agric. Fish.*, no. 29, 14 pp., 18 figs., 5 refs. London, August 1931. Price 6*d*.

An account is given of the bionomics of the principal insect pests of basket willows occurring in England, with descriptions sufficient for their recognition. Those damaging the leaves and terminal buds

include the beetles, *Phyllodecta vitellinae*, L., *P. vulgatissima*, L., and *Galerucella lineola*, F. ; *Pteronus* (*Nematus*) *salicis*, L. (willow sawfly) ; *Pontania proxima*, Lep. (*gallicola*, Steph.), and other willow gall sawflies ; various willow Aphids and small willow moths such as *Enarmonia* (*Hypermecia*) *cruciana*, L., and *Depressaria conterminella*, Zell., and *Rhabdophaga heterobia*, H. Lw., *R. terminalis*, H. Lw., and other gall midges. Insects damaging the rods include, besides some of the above, the Aphid, *Melanoxantherium salicis*, L. ; *Cryptorrhynchus lapathi*, L. (willow weevil) ; *R. saliciperda*, Duf. (willow wood midge) ; and *Trochilium bembeciforme*, Hb. (willow hornet clearwing). The stumps are injured by the weevil, *Aromia moschata*, L., *T. bembeciforme*, and *Aegeria* (*Sesia*) *formicaeformis*, Esp. (red-tipped clearwing). General measures of control, which cover the attacks of several kinds of pests, are outlined.

HUKKINEN (Y.). **Rehukaalin viljely ja tuholaiset.** [The Growing of Fodder Cabbage and its Insect Pests.] [*In Finnish.*]—*Maatalous*, xxiv, no. 1, pp. 21–24, 4 figs. Helsingfors, 1931.

During recent years the growing of fodder cabbage has increased in Finland. The most important pests of this crop include *Phaedon cochleariae*, F., *Blitophaga opaca*, L., and Halticids, the chief damage being caused in the spring, when the plants are very young and do not offer sufficient leaf surface for dusting with arsenicals. The overwintered adults of *P. cochleariae* can be attracted in large numbers by white mustard (*Sinapis alba*) sown early as a trap crop and can be easily collected with nets. When the larvae appear on the leaves, the mustard should be dusted with arsenicals and after 2–3 days destroyed by ploughing, or, if it is grown for seed, dusted again. Other pests found on fodder cabbage are *Plutella maculipennis*, Curt., which was especially numerous in 1928, *Pieris brassicae*, L., and *Phorbia* (*Hylemyia*) *brassicae*, Bch. *Ceuthorrhynchus quadridens*, Panz., *Phytomyza flavicornis*, Fall., and other insects are likely to become serious pests in the future.

DELAMARRE DE MONCHAUX (—). **La Doryphora en Loir-et-Cher.**—*Bull. Soc. Nat. Acclim. Fr.*, lxxviii, no. 9, pp. 321–322. Paris, September 1931.

Leptinotarsa decemlineata, Say, has recently appeared in the Loir-et-Cher district, and its spread in that region is traced from place to place. Energetic measures have already been undertaken to deal with the situation. A brief account of the habits of this beetle and the methods of controlling it are outlined.

REGNIER (R.). **L'Apion du Trèfle** (*Apion trifolii* **L.**) **nuisible aux plantes potagères.**—*Bull. Soc. Sci. nat. Rouen*, (7) lxiv–lxv (1928–29), pp. 27–30. Rouen, 1930.

Apion trifolii, L., though usually a pest of clover [*cf. R.A.E.*, A, xvii, 438], also attacks other cultivated plants, especially vegetables and fruit trees. An outbreak observed in Normandy began in June and reached its maximum in July, the plants most damaged being beans, carrot, artichoke, parsley, lettuce, endive and tarragon [*Artemisia dracunculus*], whereas beet, potato, strawberry and cabbage

were not infested. Peach and plum trees were also severely attacked, pear trees growing with them being left untouched. The author found that calcium cyanide gave up to 95 per cent. mortality of the weevils when plants were treated under a bell-glass, but when the latter was not used, 50–75 per cent. recovered within 45 minutes.

Regnier (R.). **De l'alimentation des jeunes freux en Normandie.**—*Bull. Soc. Sci. nat. Rouen*, (7) lxiv–lxv (1928–29), pp. 119–127, 2 refs. Rouen, 1930.

The contents of the stomachs of some 150 young rooks from various districts in Normandy included the remains of large numbers of Coleoptera, Diptera and Lepidoptera, two Rhynchota, two Hymenoptera and one Acridid. The number and species of insect remains varied with the locality, and the author suggests that the economic status of these birds should be ascertained in each district.

André (M.). **Présence d'acariens dans les vins sucrés.**—*Bull. Soc. Zool. Fr.*, lvi, no. 4, pp. 335–340, 3 figs., 3 refs. Paris, 15th October 1931.

The mite, *Carpoglyphus anonymus*, Haller, is recorded as living in large numbers on the surface of a sample of port wine from Paris. The female is oviparous, and the species usually occurs in colonies on dried fruits. It is possible that it is a vector of *Mycoderma vini*.

Bremer (H.) & Kaufmann (O.). **Die Rübenfliege** *Pegomyia hyoscyami* **Pz.** [The Beet Fly, *P. hyoscyami*.]—*Monogr. Pflanzenschutz*, no. 7, v+110 pp., 32 figs., 188 refs. Berlin, J. Springer, 1931. Price, paper, *M.* 12.

This monograph is largely based on personal investigations on *Pegomyia hyoscyami*, Panz., in beet-growing areas in Pomerania and Silesia, which have already been noticed [*R.A.E.*, A, xvii, 250, 599], and on data from the literature. The synonymy, systematic position and food-plants of the fly are discussed, and its bionomics are dealt with at length. One chapter is devoted to the morphology and anatomy of all stages and another to predatory enemies and parasites. Much of the information on the economic importance of *P. hyoscyami*, the conditions governing the general and local outbreaks, the world distribution of the fly and its relation to the climate and weather, has been reprinted from the previous work [xvii, 599]. A chapter deals with cultural and chemical control measures, which have already been noticed from individual papers [xiii, 538; xiv, 32, 110, 376; xv, 110, 205, 228; xvi, 365, 593; xvii, 250, 438, 686].

Hüniken (E.). **Die Ausbreitung des Forleulenfrasses im Jahre 1930.** [The Distribution in Germany of Attack by *Panolis flammea* in 1930.]—*Forstl. Wschr. Silva*, xix, pp. 113–116, 1931. (Abstract in *Zbl. Bakt.*, (2) lxxxiv, no. 19–22, pp. 473–474. Jena, 11th September 1931.)

In 1930, the pine moth [*Panolis flammea*, Schiff.] in Prussia was restricted to its residual endemic numbers except in Upper Silesia, where, however, an outbreak was completely checked by the fungus,

Entomophthora aulicae and Hymenopterous parasites. In Bavaria there was a serious infestation. Under optimum life-conditions the presence of one pupa per square yard suffices to ensure defoliation by the subsequent generation.

SCHWERDTFEGER (F.). **Das Ende des Kiefernspannerfrasses in der Letzlinger Heide 1930.** [The End of the Infestation by *Bupalus piniarius* in the Letzlinger Heath in 1930.]—*Z. Forst- u. Jagdwes.*, lxiii, pp. 273–293, 1931. (Abstract in *Zbl. Bakt.*, (2) lxxxiv, no. 19–22, pp. 474–475. Jena, 11th September 1931.)

Of the various methods tried to determine the percentage of parasitism of the pine Geometrid [*Bupalus piniarius*, L.] in the Letzlinger district, Germany, prior to the emergence of the moths, none gave correct results. Allowing pigs to feed in the forest resulted in the destruction of about 62 per cent. of the pupae in one instance, and about 90 per cent. in another. Strewing kainit on the ground is unreliable owing to the possible effect of weather and of a prolonged duration of the period in which the larvae descend from the trees to pupate. Though the majority of the larvae succumb while young to weather influences, parasites were chiefly responsible for checking the outbreak in 1930.

[MAKAROV-KOZHUKHOV (L. N.).] **Макаров-Кожухов (Л. Н.). The Introduction of Substances into Plants and its Prospects in the Control of** *Phylloxera*. [*In Russian*.]—*Vestn. Vinogr. Vinodel. Vinotorg. S.S.S.R.*, iii, no. 7–8, pp. 519–526, 3 refs. Odessa, 1931.

In this discussion on the internal treatment of plants against insect pests, based on the work of Müller [*R.A.E.*, A, xiii, 62; xiv, 505; xv, 337] and including brief notes on some experiments by the author, it is suggested that the internal treatment of vines would be of much value if applied in the radical method of controlling *Phylloxera*. Instead of uprooting and destroying the vines in heavily infested areas, the plants, including the roots, could be killed by injections of high concentrations of chemicals. This would ensure starvation of all the Aphids, whereas if the vines are destroyed mechanically, some of them may continue to develop on parts of the roots left in the ground. Cases of this survival have been recorded from Germany and the northern Caucasus, *Phylloxera* having reappeared in newly planted vineyards 12 and 16 years, respectively, after the infested vines had been uprooted and the soil treated with large quantities of carbon bisulphide.

SCHEDL (K.). **Der Hemlockspanner** *Ellopia fiscellaria* **Hb. und seine natürlichen Feinde.** [The Hemlock Looper, *E. fiscellaria*, Gn., and its natural Enemies.]—*Z. angew. Ent.*, xviii, no. 2, pp. 219–275, 32 figs. Berlin, August 1931.

These preliminary investigations were made in 1928 as a result of the outbreak of *Ellopia fiscellaria*, Gn., on hemlock (*Tsuga canadensis*) in south-western Ontario. The favourite food-plant in the adjoining

region of the United States is also hemlock, but in Newfoundland and northern Quebec it is *Abies balsamea.* The geological, topographical and climatic conditions and the composition of the forests in south-western Ontario, the technique employed in the investigations, and all stages of *E. fiscellaria* are described. Hibernation occurs in the egg-stage. The eggs are laid, usually singly, on the underside of needles and branches and in cracks in the bark of the trunks.

On 1st July when the observations began the larvae were already in the second instar, with a few in the third. Fourth-instar stragglers were found on 1st August. During an outbreak, feeding extends somewhat indiscriminately to almost all the conifers and deciduous trees among the hemlocks, though *Taxus canadensis* is not attacked. Apparently only the quite young larvae are restricted to hemlock, but this is the only tree that is completely defoliated. Larvae driven to the ground by wind or heavy rain climb the nearest tree irrespective of its nature. In one observation from 6th to 17th July 20 per cent. of the larvae were on the ground and were prevented by banding from climbing up. The first pupae were seen on 2nd August. About 80 per cent. occurred in the ground litter, but many were found on old trunks with rough bark. In healthy stands 30 or more pupae per square foot or in weak stands 20 indicate very serious injury by the next generation. In some places the resultant adults were so abundant as to look like a coat of paint. The pre-pupal stage lasts normally 24–48 hours, and the pupal stage 18–26 days. The first moths appeared on 12th August. Females predominated, representing from 72 to 97·4 per cent. in one series of observations. Emergence occurred over 6 weeks, and the peak for the females was between 14th and 20th September, that for the males being about a week earlier. A female seems to lay about 100 eggs on an average.

Brief notes are given on observations on natural enemies, supplemented by further details on each species taken from the literature. In addition to birds and predacious Rhynchota they include the Tachinids, *Lydella eufitchiae,* Tns., *Winthemia* sp., *Madremyia saundersi,* Will., and *Ceromasia* (*Erycia*) *rutila,* Mg., the Ichneumonids, *Campoplex* (*Campoplegidea*) *ellopiae,* Walley, *Pimpla* (*Itoplectis*) *conquisitor,* Say, *P.* (*Ephialtes*) *pedalis,* Cress., *Amblyteles velox,* Cress., and *Hemiteles* sp., and the Pteromalids, *Dibrachys* sp. and *Pteromalus puparum,* L. In one observation parasites destroyed only 23·9 per cent. of the larvae and pupae and were therefore unable to prevent future injury. A high mortality of the newly-hatched larvae appears to be the chief factor of natural control.

JANCKE (O.). **Beiträge zur innertherapeutischen Schädlingsbekämpfung. I. Mitteilung.** [Contributions to the Control of Pests by the internal Treatment of Plants. 1st Communication.]—*Z. angew. Ent.*, xviii, no. 2, pp. 276–318, 4 figs. Berlin, August 1931

Following Müller's experiments in the internal treatment of plants against pests [*R.A.E.*, A, xiii, 62; xiv, 505; xv, 337], investigations with sucking and chewing insects have been made at Naumburg to test the value of nicotine and other substances for this purpose. Doses tolerated by the plants were also tolerated by the insects, and a satisfactory effect on the latter almost always involved injury to the former. Nicotine, absorbed by grape-vine shoots and found in the leaf-tissue, did not penetrate the tissue of *Phylloxera* leaf-galls in 7 days, so that

the Aphids feeding in the galls were unaffected. It is concluded that there is a possibility of combating some insects, especially chewing insects, by poisons through the infested plants, but that no substance employed hitherto has any practical value.

THIEM (H.) & KALANDADZE (L.). **Petroleum als Reblausbekämpfungsmittel. Zugleich ein Beitrag über das Ausbreitungsvermögen von Insektiziden.** [Kerosene as a Remedy against *Phylloxera*. Also a Contribution on the Spreading Power of Insecticides.]—*Z. angew. Ent.*, xviii, no. 2, pp. 319–343. Berlin, August 1931.

The neglect in Germany of the use of kerosene against *Phylloxera* on vines has been due chiefly to the results of investigations in 1900–02 by J. Moritz, who stated that submersion of infested roots for 20 hours sometimes failed to kill all the Aphids and, especially, all their eggs. In 1888–90 Moritz had made field experiments with promising results by pouring the oil on the ground, and as kerosene is used in Switzerland against *Phylloxera*, it was thought desirable to make further tests under uniform conditions. The work was done at Naumburg, Germany, with American water-white lamp-oil and with vine roots, 3–4 inches long, mostly infested with *Phylloxera* and its eggs. The roots were dipped for varying periods at temperatures of 2·5° C. and 14·3° C. [36·5° F. and 57·74° F.] either with or without previous soaking for 25 minutes in water. The dipped roots were allowed to drip and were then placed in damp moss until examined after one or more days. Detailed descriptions are given of these tests and of others dealing with the spreading power of kerosene and some other insecticides on the sticks used as supports for plants in pots, and on vine-shoots and vine-stakes. In these experiments it was found that the effect of kerosene on *Phylloxera* is independent of the duration of its action and of temperature. Some of the Aphids wetted by kerosene only died after several days, and some remained capable of development. Soaking the infested roots in water markedly reduced the insecticidal power of the kerosene. Some of the eggs wetted by kerosene were destroyed only after several days, and larvae hatching from treated eggs could develop on healthy roots. *Phylloxera* could not live, however, on roots wetted with kerosene, which, owing to its low surface-tension, spreads in the soil to a remarkable extent and can therefore wet any vine roots that are there. Kerosene was superior in spreading power to a number of proprietary insecticides. Kerosene emulsions spread less than undiluted kerosene, but more so than carbolineum emulsions.

KRÜGER (F.). **Untersuchungen über die Giftwirkung von dalmatischem Insektpulver auf die Larven von** *Corethra plumicornis*. [Investigations on the toxic Action of Dalmatian Insect Powder on the Larvae of *C. plumicornis*.]—*Z. angew. Ent.*, xviii, no. 2, pp. 344–353, 3 figs., 3 refs. Berlin, August 1931.

The effect of suspensions in water of pyrethrum powder on living larvae of the mosquito, *Corethra plumicornis*, F., which were chosen because they are transparent, was observed under the microscope. Morphological changes in the hypodermis, muscles and nerve fibres were seen to occur, and the injury to the nervous system may be regarded as the cause of the toxic action of pyrethrum.

BREMER (H.). **Beitrag zur Epidemiologie der Brachfliegenschäden (*Hylemyia coarctata* Fall.).** [A Contribution to the Epidemiology of *H. coarctata*.]—*Z. angew. Ent.*, xviii, no. 2, pp. 354–360, 1 map, 46 refs. Berlin, August 1931.

Records of the distribution in relation to climate of *Hylemyia coarctata*, Fall., outside Germany were investigated in view of Schnauer's statement, based on observations in that country, that the area of outbreaks does not extend further south than the zone in which day temperatures of 10° C. [50° F.] and over do not last longer than 5½ months [*R.A.E.*, A, xviii, 186]. It is found that this is correct only for a continental climate, for it applies east of Germany, but not westwards. It is incidentally pointed out that apparently *H. coarctata* only occurs in parts of Europe and Asia, a communication from the U.S. Bureau of Entomology stating that Aldrich's record of 1905 from North America is erroneous. An attempt was made to connect existing records of severe infestation with data on weather, but the available material proved inadequate, except that in most cases unusual warmth in winter and spring preceded severe injury.

MELL (R.) & HEINRICH (G.). **Beiträge zur Fauna sinica ix. Zur Biologie und Systematik der südchinesischen Ichneumoninae Ashm. (Fam. Ichneumonidae Hym.)** [Contributions to the Chinese Fauna ix. On the Biology and Classification of South Chinese ICHNEUMONINAE, Ashm.]—*Z. angew. Ent.*, xviii, no. 2, pp. 371–403, 3 figs. Berlin, August 1931.

In the first half of this paper Mell records observations on the biology of 26 species of ICHNEUMONINAE parasitic on Lepidoptera in South China, with particulars of their local distribution and hosts, and of the annual number of generations and duration of development of parasite and host. Parasitism by these Ichneumonids is, in general, negligible, but in special circumstances may have an important effect on the numbers of the host. The second half of the paper, by Heinrich, is systematic and gives descriptive notes, including one new species and one new subspecies.

[CHOLODKOVSKIĬ (N. A.).] **Холодковский (Н. А.). A Course of theoretical and applied Entomology. Vol. iii.** [*In Russian.*]—Roy. 8vo, 496 pp., 298 figs., numerous refs. Moscow, Gosud. Izd. sel'skokhoz. kolkh.-kooper. Liter. [Govt. Pub. Agric. Co-op. Lit.], 1931. Price 7 *r.*, binding 60 *kop.*

This is the third volume of a work of which the first has already been noticed [*R.A.E.*, A, xvi, 297], and the second is not to hand. As in the case of the first volume, the different chapters have been brought up to date by various authors; they deal individually with the Strepsiptera, Neuroptera, Megaloptera, Raphidioptera, Mecoptera, Trichoptera, Siphonaptera, Lepidoptera, Diptera and Hymenoptera, special attention being devoted to the last three orders. The general anatomy, morphology and bionomics of the insects concerned are discussed, and brief descriptions of the individual families, genera and some species are given, together with notes on their biology, geographical distribution in the Russian Union and elsewhere, and economic importance, remedial measures against those that are pests being indicated.

[TZUIGANKOV (S. K.).] **Цыганков (С. К.). Flowers of Sulphur and the Problem of the Control of the Red Spider in Central Asia.** [*In Russian.*]—*Za khlopkov. Nezavisim.*, no. 6–7, pp. 66–71, 27 refs. Tashkent, 1931.

This is a discussion of the use of flowers of sulphur for the control of the red spider [*Tetranychus telarius*, L.] on cotton in Central Asia and the factors responsible for its toxicity. Evidence from Russian literature on the satisfactory results obtained with it against various pests is given. It acts as a fertiliser stimulating the growth and development of the cotton plants and does not injure them. Experiments have shown that the toxicity of the dust was increased when it was applied 2–3 days after the field had been irrigated. It is recommended to mix the sulphur with an equal quantity of lime, which must be freshly slaked in order to ensure an alkaline mixture, and apply it at the rate of 40 lb. of the mixed dust to the acre. Excellent results were also obtained with flowers of sulphur as a spray (1–5 lb. to 10 gals.).

[YAKHONTOV (V. V.).] **Яхонтов (В. В.). The Control of the Lucerne Leaf Weevil and Notes on its Biology.** [*In Russian.*]—*Za khlopkov. Nezavisim.*, no. 6–7, pp. 71–74. Tashkent, 1931.

In many parts of Central Asia, *Hypera* (*Phytonomus*) *variabilis*, Hbst., is an important pest of lucerne, the larvae sometimes completely destroying the first crop. The overwintered adults appear in early spring, when they feed on the stems and oviposit in cavities made in them. The young larvae at first remain inside the stalks, passing to the base of the closed terminal leaves and feeding on the growing tip, and later on move to the surface of the leaves, of which they destroy the parenchyma. In Tashkent and Bokhara, this period coincides with the petal fall of apples. Pupation occurs on the leaves. The young adults feed for a short time on lucerne, but with the beginning of hot weather enter a diapause, sheltering under grass or fallen leaves. Feeding is resumed as soon as the weather becomes colder, and if the lucerne is mown, the weevils attack other crops, including cotton seedlings [*cf.* *R.A.E.*, A, xviii, 329]. Hibernation occurs in various places that offer shelter from frost, chiefly in the soil close to the surface.

For control, cultural methods are recommended rather than dusting with calcium arsenite, which under the conditions of Central Asia is too expensive and less effective. To destroy the eggs in a severely infested field, as much as possible of the parts of the plants above ground should be cut and removed early in the spring when the stalks are about 3 ins. high. Disking to a depth of about 2 ins. when the spring growth of lucerne just commences is also of value and stimulates the development of the plants. If one of these measures has not been carried out, it is advisable to remove the first crop earlier than usual, preferably at the beginning of the petal fall of apples. To safeguard the second crop, spraying with 5–6 lb. Paris green, 10 lb. lime and 120 gals. water after the first has been cut may prove useful. In one instance, this spray killed practically all the weevils on cotton seedlings. The hibernating adults may be destroyed by flooding the fields in the winter, or by burning the stubble in the autumn ; if patches of uncut lucerne are left, the weevils will concentrate in them for hibernation, so that they alone can be burnt, instead of the whole field. The application of superphosphates to the

soil early in the spring considerably increases the resistance of the plants to attack. Lucerne should not be grown in one field for more than 4 consecutive years, as old fields are more severely infested than young ones.

[Radzievskaya (S.).] **Радзиевская (С.). ***Stethorus punctillum*—**A Destroyer of the Red Spider.** [*In Russian.*]—*Za khlopkov. Nezavisim.*, no. 6–7, pp. 75–81. Tashkent, 1931.

Observations were carried out in Tashkent in the autumn of 1929 and the spring and summer of 1930 on the bionomics of the Coccinellid, *Stethorus punctillum*, Wse., which is an important predacious enemy of the red spider of cotton [*Tetranychus telarius*, L.]. Descriptions of the eggs, larvae and adults are given. There are probably several generations during the season of activity, which lasts from March till the end of September, when the adults begin to hibernate on trees, sheltering in cracks on the bark in batches of 10–50. In the spring they are at first found on weeds, which harbour the red spider, then migrate to apple trees infested by another mite, and in the autumn to cotton. In October of 1929 numerous larvae and adults were present on a young white poplar on which the apple mite occurred.

In September the egg, larval and pupal stages lasted 1–2, 7–8 and 4–5 days respectively ; oviposition starts about a fortnight after the emergence of the young adults. The larvae and adults feed on all stages of *T. telarius*, showing a preference for eggs. The larvae die in about two days if deprived of food. A table is given showing the number of mites and eggs consumed by individuals of each instar, and the process of regurgitation practised in feeding upon the mite is described. One larva consumes in the course of its life about 640 eggs and 160 adults of *T. telarius*. The larvae are very active and rapidly migrate from leaf to leaf and from one cotton plant to another, but prefer to be under the protective cover of the web with which the mites cover the leaves, and never feed outside it. Pupation occurs on the leaves under the web.

It has been recorded from several localities that whenever *S. punctillum* was abundant, *T. telarius* rapidly decreased in numbers.

[Znoĭko (D. V.).] **Знойко (Д. В.). Pests of Cotton in the south-western Regions of the Ukraine according to Observations in the Year 1930.** [*In Russian.*]—*Za khlopkov. Nezavisim.*, no. 6–7, pp. 145–159, 6 diag., 6 figs., 4 refs. Tashkent, 1931.

This is a report on the first attempt to determine the importance of insects injurious to cotton in the districts of Odessa and Kherson, where systematic observations were carried out in 1930. The roots of young cotton seedlings were damaged chiefly by the larvae of various Elaterids and those of *Euxoa tritici*, L., which were active from mid-May till the end of June, and from the beginning of June till mid-July respectively. Previous observations on *E. tritici* showed that near Odessa the flight of the adults sometimes begins at the end of June and lasts till October, the peak being reached about mid-September. The injury caused by the larvae of *E. segetum*, Schiff., and *Anisoplia segetum*, Hbst., was insignificant. In some localities *Thrips tabaci*, Lind., severely damaged the leaves of young plants in June, becoming especially abundant in July in fields from which weeds had not been

removed. The numbers of the thrips on the plants rise or fall as the relative humidity increases or decreases. A table is given showing the susceptibility to it of the different varieties of cotton. It also occurred on a number of other cultivated plants, especially tomatos, peas and soy beans, and on weeds. *Aphis gossypii*, Glov., *A. euonymi*, F., and *Myzus persicae*, Sulz., were abundant near Kherson, and in one instance a colony of the root Aphid, *Trifidaphis phaseoli*, Pass., was found on cotton. Predacious enemies, which were numerous in the Aphid colonies, included *Sphaerophoria scripta*, L., *Coccinella* (*Synharmonia*) *conglobata*, L., *C. septempunctata*, L., *Adalia bipunctata*, L., *Adonia variegata*, Goeze, and *Propylaea quatuordecimpunctata*, L.

Tetranychus telarius, L. (*Epitetranychus althaeae*, v. Hanst.), which was scarce in June, became exceedingly abundant in some fields at the time of the flowering of cotton, the infestation spreading from the edges of the fields to the centre. Though hardly any plant was free from infestation, the injury caused was not severe, as owing to cold weather in August, the mites did not reproduce rapidly and the infested leaves dried up slowly, so that the development of the plants was not impeded. Observations on the life-cycle of the mite showed that at 31–24° C. [87·8–75·2° F.] the egg and larval stages lasted two days each, and the nymphal stage one day. Oviposition occurred 3–4 days after the adult stage was reached at temperatures varying from 31 to 8° C. [46·4° F.]. At 22° C. [71·6° F.] the eggs hatched in 2–3 days, and at 15–18° C. [59–64·4° F.] in 10 days; at 7–8° C. [44·6–46·4° F.] none hatched. A list is given of cultivated and wild plants on which *T. telarius* was found.

The larvae of *Heliothis* (*Chloridea*) *obsoleta*, F., were abundant near Odessa at the end of September, feeding on the flowers and seeds in the bolls. Pupation began in mid-September. In the laboratory the adults emerged at the end of the month, and one moth was taken in the field, indicating that some of the adults may emerge before hibernation. Less important pests were *Phytometra gamma*, L., *Scotogramma trifolii*, Rott., and *Loxostege sticticalis*, L., and occasionally *Calliptamus italicus*, L., and *Locusta migratoria*, L., which were rare.

Borg (P.). [Report of the] **Plant Pathologist.**—*Ann. Rep. Dept. Agric. Malta 1930–31*, pp. xiv-xvii. Malta, 1931.

There was a severe outbreak of Aphids in Malta during 1930–31. Seed-beds of cabbage were seriously attacked by *Brevicoryne* (*Aphis*) *brassicae*, L., associated with *Haltica oleracea*, L., *Phyllotreta nemorum*, L., and *Aleurodes brassicae*, Wlk. *Aphis rumicis*, L., is controlled on broad beans, on which it occurs more or less annually, by the practice of topping the plants soon after they have flowered. *Toxoptera aurantii*, Boy., was not so prevalent on *Citrus* as in the previous year [*R.A.E.*, A, xix, 290], but ornamental plants and shrubs were badly infested. Coccinellids are mainly responsible for the control of these pests, the most important, in addition to those already mentioned [*loc. cit.*], being *Exochomus quadripustulatus*, L., *Adalia bipunctata*, L., and *Coccinella undecimpunctata*, L. Numbers of these predators often come over the sea during March. They also hibernate as adults on the Islands, in crevices in the bark of trees and under stones on walls, but apparently do not multiply in sufficient numbers early enough to check the first infestations of Aphids. *Eriosoma* (*Schizoneura*)

lanigerum, Hausm., has now been practically eradicated in two localities, where several years ago it was rapidly destroying apple trees. Two or three centres of a mild infestation were present in the spring, but these probably resulted from new introductions. The systematic treatment with sprays of 5 per mille potassium sulphocarbonate or 2 per mille potassium permanganate against armoured scales in orange groves [*loc. cit.*] has been continued and has resulted in a great reduction in the numbers of trees badly infested with *Parlatoria zizyphus*, Lucas (*lucasi*, Targ.) and *Lepidosaphes beckii*, Newm. (*Mytilaspis citricola*, Pack.). Difficulty has been experienced in controlling *Chrysomphalus dictyospermi*, Morg., in citrus nurseries without damaging the young grafted plants.

Phylloxera appeared to be less injurious than usual on American vines in nurseries. *Ceratitis capitata*, Wied., occurred in unusually large numbers and caused great damage to stone-fruits. Good results were again obtained in its control [*loc. cit.*].

PAOLI (G.). **Sull' arricciamento del cotone.** [On the Leaf-curl of Cotton.]—*Atti primo Cong. Studi colon., Firenze, 8–12 Aprile 1931*, reprint 7 pp. Florence, 1931.

Leaf-curl occurs in many plants, cotton in the Tropics being specially affected. This paper discusses the occurrence of insects in relation to the disease in this crop in various parts of Africa. In Italian Somaliland it is produced by a Jassid, *Empoasca facialis*, Jac. [*R.A.E.*, A, xviii, 659], the author's determination in this case having been confirmed by Jacobi. Examination of the genitalia is necessary for specific distinction in these insects, and in view of the fact that Jassids have been considered in various regions to have no relation to cotton leaf-curl, the author investigated the identity of some African species. Examples from the Sudan, regarded as *E. facialis* [xviii, 634], are said to represent an undescribed species of the same genus and a species of *Typhlocyba*. Leaf-curl in the Sudan is not carried by these Jassids, but by an Aleurodid [*Bemisia gossypiperda*, Misra & Lamba (xix, 708)]. From the Belgian Congo, Jassids identical with the Somali *E. facialis* were received from cotton, together with a few others, as yet unidentified, of the same genus. Jassids from Southern Nigeria also agreed with the Somali *E. facialis*, but leaf-curl there is ascribed to an Aleurodid [xviii, 364] said by the present author to be of the genus *Bemisia*. Though a species of *Bemisia* occurs on cotton in Italian Somaliland, it is rare and not injurious, and it is difficult to understand why *E. facialis* in Nigeria does not cause leaf-curl. Specimens from Rustenburg, Transvaal, agree fairly closely with Naudé's description of *E. facialis* from specimens from Barberton where this disease is common [xv, 195], but are quite different from the Somali species.

LUGARD (W. J.). **Invasion de sauterelles** (*Locusta migratorioides*) **dans les Uelé.**—*Bull. agric. Congo belge*, xxii, no. 1, pp. 71–74, 3 figs. Brussels, March 1931.

Swarms of locusts have been present for several years in the extreme north of Uelé, Belgian Congo, near the frontier, and in December 1930 immense swarms of *Locusta migratoria migratorioides*, R. & F., from the North-west overran the northern and the central districts. This species apparently does not feed on cotton ; in one instance millions of

locusts remained on a cotton plantation for several days without doing any damage. The preparation of a poisoned bait [*R.A.E.*, A, xvii, 507] is described.

BREDO (H. J.). **Contribution à l'étude de** *Sahlbergella singularis*, **Hagl.**—*Bull. agric. Congo belge*, xxii, no. 1, pp. 81–98, 8 figs., 6 refs. Brussels, March 1931.

Sahlbergella singularis, Hagl., all stages and both sexes of which are briefly described, causes considerable injury to cacao in the Belgian Congo. Both adults and larvae live on cacao trees, preferably on the young shoots and at the base of the pod peduncles. The adults evade capture by dropping to the ground or by flying from one tree to the next. Oviposition occurs mainly in the rainy seasons, which are from October to December and in April and May. Although a heavy infestation has been observed in January and February, an exhaustive search has failed to reveal the presence of any eggs at that period. The presence of large numbers of very young larvae at the bases of the pod peduncles suggests that the eggs are laid there or in the immediate neighbourhood. The larvae do not distribute themselves over the trees until after the first moult, and may then be found principally in the forks of the branches, in cankers and on the upper part of the pods. At night the larvae leave their shelters and injure the trees by making repeated punctures in the leaf peduncles. Contrary to the belief hitherto prevailing that *S. singularis* only attacks trees of three years old and upwards, young plantations have been observed completely infested. The injuries are of two kinds, one affecting the branches and trunk and finally resulting in general weakening of the trees and decrease in flower formation sometimes amounting to 60 per cent. of the crop, and the other, which is directed against the pods, rendering these liable to attack by other insects and fungi. The latter injury is considerably less serious, and where the pods attacked are fairly far advanced, does not hinder them from maturing. The variety of cacao producing red pods has been observed to possess a higher degree of resistance. Careful observations of a plantation indicated that infestation came from an adjacent forest and in the direction of the prevailing winds. A search in the forest for native food-plants resulted in the discovery of a heavy infestation on *Cola diversifolia*, but careful examination of numerous bushes of *Eriodendron anfractuosum*, the native food-plant in the Gold Coast [*R.A.E.*, A, iii, 528], failed to reveal the presence of any of the Capsids. Several cankered *Cola* trees were found to have been abandoned by *S. singularis* in favour of adjacent cacao.

Preventive measures undertaken were the destruction of all *Cola* trees whether in the forest or plantation, all the cankers being burnt over with a blow-lamp; and the isolation of the plantation from the forest by the creation of a deforested strip 25 yds. wide. It was found that hand collection demanded a great amount of labour, and produced little apparent result in spite of the large numbers taken.

Of a number of insecticides tested, formulae for some of which are given, the most promising was carbon tetrachloride in a soapy emulsion (2–4 per cent. soap and 4 per cent. carbon tetrachloride). From 10 to 20 gms. of the solution were required to treat a tree three years old, according to the number of pods. In a plantation, half of which had been subjected to treatment, 47 larvae were collected from the treated

portion as compared with 518 from that left untreated. A second treatment, about 10 days after the first, is recommended in order to reduce the possibility of overlooking some of the trees, and to destroy any larvae that have escaped the first application. An ant, *Oecophylla smaragdina longinoda*, Latr., was found to be a valuable predator on *S. singularis*.

DE BENEDICTIS (A.). **Le cavalette** (*Schistocerca gregaria* **Forsk.**) **in Eritrea durante il 1930.**—*Rass. Econ. Colon.*, 1931, no. 7–8, 18 pp., 32 pls. Rome, 1931.

The hoppers of *Schistocerca gregaria*, Forsk., that hatched in February 1930 in Eritrea were all destroyed. Adult swarms from the Anglo-Egyptian Sudan and Abyssinia appeared in the colony in May, after which the locusts were present until the end of the year. Breeding took place in July-August practically throughout the colony, and again in December on the Red Sea coast. An account is given of the biology of this species ; in Eritrea the embryonic and larval development required 14–30 and 40–60 days respectively. It is concluded that Eritrea is subjected, in the course of a year, to a summer and an autumn invasion, each of which represents a successive generation, and that the swarms constituting these invasions originate chiefly in Abyssinia, and partly in the Sudan, only a few being of local origin.

The eggs of *S. gregaria* were attacked by *Stomatorrhina lunata*, F., and *Mylabris* sp., and the hoppers and adults by *Sarcophaga* sp., *Sphex subfuscatus*, Dahlb., and several birds. Numerous first instar hoppers were killed by the fungus, *Empusa grylli*.

The organisation of control is described. The use of poison baits, prepared either with bran or with *Sorghum* mixed with 3 per cent. (dry weight) of sodium arsenite, was found to be the cheapest and the most effective method, 90 lb. being sufficient for 1 acre. Flame throwers were also extensively used, the fuel employed consisting of 5 parts of light tar oil to one of kerosene.

In conclusion the author stresses the necessity of organising a scientific mission for the study of the locust problem.

DE LEPINEY (J.). **Sur l'orientation des mouvements gregaires de** *Schistocerca gregaria*.—*Rev. path. vég. Ent. agric.*, xviii, no. 6, pp. 193–200, 6 refs. Paris 1931.

This is a general discussion of the problem of the orientation of movements in bands of hoppers and swarms of adults of *Schistocerca gregaria*, Forsk. It is concluded that the problem is a very complex one and that many factors are as yet unknown. The fact that orientation varies according to the seasons suggests the existence of some factors connected with them.

MIMEUR (J.). **Un nouveau Chaitophorus du peuplier** *Chaitophorus hickelianae*.—*Rev. path. vég. Ent. agric.*, xviii, no. 6, pp. 201–211, 1 pl., 6 figs. Paris, June 1931.

Descriptions are given of the alate and apterous viviparous females, the oviparous female and the alate and apterous males of *Chaitophorus hickelianae*, sp. n., which has been found on *Populus alba* (*hickeliana*) in various localities in eastern Morocco, with an account of its bionomics.

It was found that the sexual forms were not essential for the overwintering of the species, as the dormant period of *P. alba* is very short on the Atlantic coast of Morocco, and parthenogenetic reproduction continues at a reduced rate on old leaves that are always found on some of the trees until the new buds open.

Frappa (C.). **Notes sur deux nouveaux hémiptères nuisibles au caféier, à Madagascar.**—*Rev. path. vég. Ent. agric.*, xviii, no. 6, pp. 212–214, 1 ref. Paris, June 1931.

Some of this information on the Pentatomid, *Antestia clymeneis*, Kirk., and the Tingid, *Galeatus involutus*, Drake, attacking coffee (*Coffea arabica*) in Madagascar has already been noticed [*R.A.E.*, A, xix, 599]. Both bugs are briefly described. Adults of *G. involutus* appear at the beginning of October, and adults and larvae of all ages are present up to the end of March. They remain for preference on the lower surface of the leaves. The eggs are generally laid singly or in groups of two or three, half buried in the leaf petioles. The presence of all stages simultaneously indicates that there are a number of generations during the hot season (November–April) and that the cold season (April–November) is passed in the egg stage. The oldest foliage is most subject to attack, the leaves becoming yellow and falling prematurely, and bushes subject to heavy defoliation die.

Vayssière (P.). **Un nouveau parasite du cotonnier à Madagascar** *Xyloperthodes castaneipennis* **Fåhr.**—*Rev. path. vég. Ent. agric.*, xviii, no. 6, pp. 215–216. Paris, June 1931.

The Bostrychid, *Xyloperthodes castaneipennis*, Fåhr., is recorded as attacking cotton in Madagascar, where it has previously been observed on *Lagerstroemia*, *Bixa orellana* and *Mimosa*. Although it occurs on these bushes at all seasons of the year, it appears in the greatest numbers between April and November. On any of the plants attacked, branches 10–12 mm. in diameter are most subject to infestation. A circular tunnel 3–4 mm. in diameter is bored in the branch, immediately beneath the bark and may penetrate further into the wood. Attacked branches become weak and break easily at the slightest jar, and the bolls on them fall without maturing. For control the branches should be cut just below the horizontal gallery after the position of the entrance hole has been exactly determined, and the cuttings burnt.

Risbec (J.). **Note sur un parasite du cocotier en Nouvelle Calédonie** (*Agonoxena* **sp.**).—*Rev. path. vég. Ent. agric.*, xviii, no. 6, pp. 217–219. Paris, June 1931.

A species of *Agonoxena*, the adult, larva and pupa of which are briefly described, has caused considerable injury to coconut palms in New Caledonia. The larvae, which require at least 40 days to mature, bend over the leaves of the palms around their central vein and bind the two pieces together with a coarse silken web. Within the shelter thus formed, they feed on the lower surface and parenchyma of the leaf, and the upper surface turns yellow, thus revealing the injury beneath. The larvae sometimes bind together two or more adjacent leaves, in which case the upper surface may be destroyed. A con-

centrated attack by this Tineid is liable to stop the procdution of an entire grove of coconut palms. The older leaves are first attacked, but when a tree is heavily infested the young fresh foliage also suffers. As it is extremely difficult to destroy the larvae once an infestation has obtained a hold, repeated and constant inspections are essential, and at the slightest sign of attack the affected part should be cut off and burnt. If necessary, the whole tree should be sacrificed. Larvae living in exposed parts of the coconut palm are easily destroyed by wind and other atmospheric influences. A large number of the moths may be caught by light traps. A spider, *Corambis insignipes*, Simon, appears to be of some value as a natural enemy.

HARGREAVES (E.). **Entomological Work.**—*Ann. Rep. Dept. Agric. Sierra Leone 1930*, pp. 27–28. Freetown, 1931.

Investigations were carried out in Sierra Leone during 1930 to determine the vectors of mosaic diseases of cassava [*Manihot utilissima*] and ground-nut [*Arachis hypogaea*]. No symptoms have yet been produced on healthy plants with Aleurodids or mites in the former case or with *Aphis laburni*, Kalt., *Halticus tibialis*, Reut., or a Delphacid and a Jassid common on the crop in the latter one. The more important fruit-piercing moths attacking *Citrus* are *Achaea catocaloides*, Gn., *A. lienardi*, Boisd., *Hypocala rostrata*, F., and *Othreis fullonica*, L. *A. catocaloides* is the most numerous and apparently has two generations a year, the adults of which emerge in June and December. It has been found breeding on *Alchornea cordifolia*. The Limacodid, *Parasa vivida*, Wlk., which is easily controlled by an arsenical spray, damaged coffee in nurseries in August. The larvae, which may aestivate for more than four months, made cocoons at the beginning of September, and the pupal period lasted 17–20 days. About twenty swarms of migratory locusts [*Locusta migratoria migratorioides*, R. & F.] were recorded in January-March, fourteen of which apparently returned to French Guinea. Eggs were laid, but the resulting hoppers were dealt with by means of trenching, spraying and dusting with Paris green and poison baits, and little damage resulted. During November and December seven swarms migrated from French Guinea. The use of flame-throwers was found to be impracticable under local conditions.

JACQUET (J.). **Une bruche parasite des acacias.**—*Bull. Soc. linn. Lyon*, x, no. 13, pp. 100–101, 2 refs. Lyons, 6th September 1931.

Pseudopachymerus (*Bruchus*) *lallemanti*, Mars., is recorded from Algeria as infesting seeds of *Acacia aromatica*, a plant introduced from Chile and cultivated for the manufacture of perfume.

CHEVALIER (A.). **Sur un dangereux ennemi du caféier en Guinée française : le borer des rameaux** (*Xyleborus morstatti* **Haged**).—*Rev. Bot. appl. Agric. trop.*, xi, no. 120, pp. 661–665, 4 figs. Paris, 1931.

Besides the two borers of coffee noticed in the next paper, a smaller one has been found in French Guinea. It was recorded by A. Sudres from the borders of the hinterland of Liberia in a report dated

2nd September 1930, and was later determined as *Xyleborus morstatti*, Hag. According to Sudres, the female deposits from about 30 to 50 eggs in a gallery bored in a young coffee branch. There are several generations a year, all stages being found in the branches at any season. A branch of the current year or the previous one is chosen for attack, or the main stem of nursery plants. The gallery runs through the bark and wood to the medullary canal, and then follows the latter; it is not as a rule more than about an inch in length. One or two galleries are enough to destroy a branch, but there may be 5–10 in a branch 24–30 inches long. Wild coffee (*Coffea robusta*) is preferred for attack, and *C. arabica* is also susceptible; neither *C. stenophylla* nor *C. liberica* have been found infested. *X. morstatti* is considered the most dangerous pest of coffee in the forest region of French Guinea; from 15 to 20 branches are often attacked on one bush, so that it becomes very weak. The remedy suggested is to cut off and burn all infested branches and to burn completely all badly infested bushes.

Chevalier (A.) & Dufrenoy (J.). **Destruction du borer du caféier (*Apate monacha*) par un champignon parasite.**—*Rev. Bot. appl. Agric. trop.*, xi, no. 121, pp. 738–740, 2 figs., 1 ref. Paris, 1931.

With reference to the recent discovery of two borers in coffee in French Togoland [*R.A.E.*, A, xix, 55], the authors record finding the same insects in the Ivory Coast and French Guinea on various species of cultivated coffee. The Lamiid, *Bixadus* (*Monohammus*) *sierricola*, White, is only rarely found and always on dying bushes, but the Bostrychid, *Apate monacha*, F., seems to be very widespread and sometimes attacks perfectly healthy ones, living also on a number of other woody plants. Bushes 2 or 3 years old are frequently attacked. The only remedy that has been recommended is the injection of an insecticide into the gallery, which is then closed up with clay. A severe infestation in a plantation of *Coffea liberica* 3 or 4 years old in the Ivory Coast was investigated, and more than 30 per cent. of the stems contained borers, but these were dead and mummified, and covered with the fine mycelium of an entomophagous fungus that had developed during the wet season, which was just over. This fungus has not been found in the dry season in French Guinea where *A. monacha* abounds, and it is thought unlikely that it could be artificially spread in infested coffee plantations.

Morison (G. D.). **An *Acarapis* living externally on the Honey-bee.**—*Bee Wld.*, xii, no. 10, pp. 110–111. Camberley, Surrey, October 1931.

The examination between 6th February and 8th August 1931 of 113 samples of bees from 73 apiaries showed 43 samples from 30 apiaries in England, Scotland, Wales and Ireland to be infested with a species of *Acarapis* living externally, 11 of these samples being infested also with *Acarapis woodi*, Rennie, in the tracheae. Most of the infested bees were foragers of varying ages, the youngest being about a week old. The external mite appears to breed on all the commoner races of bees kept in the British Isles. All the immature stages are found in the groove crossing the back of the thorax of the bee,

the eggs being probably attached by some sticky substance to the hairs. As the mites of all stages die after 3 days on dead bees, even in a humid atmosphere, it has not been found possible to rear immature individuals on them at room temperature. All mites in samples of bees of two colonies, infested both internally and externally, were killed by the administration of a suitable dose of Frow's mixture, which should therefore be effective in controlling the external mites if they prove harmful to the bee. The external mite found in the British Isles is identical morphologically with *A. woodi*, and may be a biological race of the form breeding in the tracheae of living bees. None of the females found by the author showed the longer segments of the fourth pair of legs, which was the morphological character on which Morgenthaler based his species, *A. externus* [*R.A.E.*, B, xvii, 286], and which was present in specimens of *A. externus* sent to him for comparison.

FINTESCU (G. N.). **Contributions à la biologie de la mouche à scie des feuilles du poirier.**—*1er Cong. nat. Naturalistes Roumanie, Cluj 1928*, pp. 159–161. Cluj, Editura Societatea de Științe, 1930. [Recd. September 1931.]

A brief account is given of observations made in 1914 in the district of Jassy on *Caliroa limacina*, Retz. (*Selandria atra*, auct.), attacking pear trees. The behaviour of the females before and during oviposition, which took place in the beginning of June, is described. Eggs are laid singly and usually one to a leaf, being pushed through a cut in the lower surface and the mesophyll and placed between the epidermis of the upper surface and the cuticle. The larvae hatch in 8–10 days and after 25–35 enter the soil and make cocoons. The number of generations was not ascertained, but mature larvae were observed on the trees from July till the beginning of September. Hibernation occurs in the cocoon, the larvae pupating at the end of May.

MARCU (O.). **Contribuţiuni la oecologia unor distrugători ai pădurilor Bucovinei.** [Contributions to the Oecology of some Forest Pests of Bukovina.]—*1er Cong. nat. Naturalistes Roumanie, Cluj 1928*, pp. 327–336, 3 figs., 16 refs. Cluj, Editura Societatea de Ştiinţe, 1930. (With a Summary in German.) [Recd. September 1931.]

Associations of bark-beetles occur on all conifers irrespective of the age of the tree, but varying with its condition. Species that in healthy trees usually occur on the apical part and top branches, attack the lower part as well if the tree is weakened. Associations of *Cryphalus abietis*, Ratz., with *Ips* (*Pityogenes*) *chalcographus*, L., and of these two species with *Pityophthorus micrographus*, L., are found in young spruces and in the top parts of old ones, while the lower parts are attacked by *I. typographus*, L., and *I. amitinus*, Eich. As the trees become less vigorous, *I. chalcographus* also occurs in the lower parts. Similar associations may be observed in fir [*Abies*] in the case of *Cryphalus piceae*, Ratz., *I.* (*Pityokteines*) *spinidens*, Reitt., *I.* (*P.*) *curvidens*, Germ., *I. chalcographus* and *Pityophthorus micrographus* (though the last two are normally pests of spruce), and in pine in the case of *Ips* (*Pityogenes*) *bidentatus*, Hbst., and *Pityophthorus glabratus*, Eich., on

Pinus montana, and *Myelophilus* (*Blastophagus*) *piniperda*, L., *I. bidentatus*, *I. suturalis*, Gyll., *I. amitinus* and *I. acuminatus*, Gyll., on *Pinus sylvestris*. *I. acuminatus* has one generation a year in Bukovina, and *Xyloterus lineatus*, Ol., two. Observations on *I. spinidens* have shown that old beetles continue to lay eggs while young adults are ovipositing, and thus give rise to a new brood.

[Vereshchagin (B.).] Vereșceaghin (B.). **Periodicitatea apariției inamicilor plantelor cultivate in legătură cu conditiunile naturale.** [Periodicity in the Occurrence of Pests of agricultural Plants in Relation to natural Conditions.]—*1er Cong. nat. Naturalistes Roumanie, Cluj 1928*, pp. 411–417. Cluj, Editura Societatea de Științe, 1930. (With a Summary in French.) [Recd. September 1931.]

The author discusses the effect on outbreaks of insect pests and diseases of plants of such factors as condition of soil, situation of the infested area, environment, meteorological conditions and parasites. Owing to changes in the natural conditions of the former breeding-places of *Locusta* (*Pachytylus*) *migratoria*, L., in Rumania, this locust no longer occurs in large numbers. *Melolontha hippocastani*, F., is present in some districts only, the larvae preferring forest soil. Though outbreaks of *M. melolontha*, L., which in Bessarabia has a three year life-cycle, have occurred periodically for a number of years, the expected flight of the adults did not take place in 1926, probably owing to the severe drought in 1925, which was unfavourable to the larvae. Outbreaks of *Aporia crataegi*, L., are affected by parasites, of which *Pimpla instigator*, F., and *Theronia atalantae*, Poda (*flavicans*, F.) are the most important. *Lecanium* (*Physokermes*) *coryli*, L., which since 1911 has caused severe damage to plum trees in Bessarabia, has recently considerably decreased in numbers, probably owing to the activity of *Exochomus quadripustulatus*, L., and possibly other natural enemies. *Eriosoma lanigerum*, Hausm. (woolly apple aphis), which is gradually spreading from the south of Bessarabia to the north, breeds in damp places, being especially abundant in years of heavy rainfall.

Brown (R. C.). **Observations on the Satin Moth and its Natural Enemies in Central Europe.**—*Circ. U.S. Dept. Agric.*, no. 176, 19 pp., 1 fig., 9 refs. Washington, D.C., August 1931.

An account is given of observations on the bionomics in central Europe of *Stilpnotia salicis*, L., and of its parasites, carried out as part of the work of the laboratory established at Budapest in 1926 primarily for the purpose of studies on *Porthetria dispar*, L., and *Nygmia phaeorrhoea*, Don., with a view to introducing some of their natural enemies into the United States. Poplars (particularly *Populus nigra* var. *italica* and *P. nigra*, which are the preferred food-plants of *S. salicis*) and willows are widely distributed throughout central Europe. The development of *Stilpnotia* is retarded when it is feeding on *P. alba*, and only in one instance were large numbers of the larvae found on willow. During 1926–29 the moth was observed in varying degrees of abundance at 17 different points within a radius of about 18 miles

of Budapest, and also at Vienna and in Poland. In the vicinity of Budapest, its life-cycle is similar to that in New England, but a partial second generation may occur.

Hymenopterous and Dipterous parasites, some of which are discussed in detail, and the fungi, *Beauveria globulifera* and *Isaria farinosa*, are the principal natural enemies of this moth, although the predacious mite, *Pediculoides ventricosus*, Newp., may play an important part in its control. The Hymenopterous parasites are *Apanteles solitarius*, Ratz., *Meteorus* sp., *Rhogas unicolor*, Wesm., and *Eupteromalus nidulans* (Först.) Thoms. [*R.A.E.*, A, xviii, 151], which attack the larvae ; and *Telenomus mayri*, Kieff., which attacks the eggs. The Tachinids are *Carcelia gnava*, Mg., *Tachina larvarum*, L., *Compsilura concinnata*, Mg., *Zenillia libatrix*, Panz., and *Phorocera agilis*, R.-D. The individual parasites appear to be of varying importance in different areas, and the sudden practical disappearance of heavy infestations by *Stilpnotia* in certain districts near Budapest in 1929 suggests that other factors, the nature of which is unknown, may sometimes be the cause of control.

van Poeteren (N.). **Verslag over de Werkzaamheden van den Plantenziektenkundigen Dienst in het jaar 1930.** [Report on the Work of the Phytopathological Service in 1930.]—*Versl. Plantenziektenk. Dienst*, no. 64, 189 pp., 8 pls. Wageningen, September 1931.

Many of the pests occurring in Holland in 1930 have been recorded in previous reports [*R.A.E.*, A, xix, 242, etc.]. *Thrips angusticeps*, Uzel, injured oats grown after flax [*cf. loc. cit.*]. Young rye plants were infested by the Chloropid, *Crassiseta cornuta*, Fall., the injury resembling that by *Oscinella* (*Oscinis*)*frit*, L. The method of trapping *Otiorrhynchus sulcatus*, F., on vines in greenhouses by means of bundles of wood-wool placed at the foot of the stems proved very effective. *Phyllobius pyri*, L., attacked the leaves and stems of tomato plants in a greenhouse built on newly-mown meadow land, where this beetle is common. Cauliflowers were infested by *Tortrix* (*Cacoecia*) *costana*, F. A 2 per mille nicotine spray proved effective against *Phytomyza chrysanthemi*, Kow., mining the leaves of chrysanthemums. In one locality pines were severely attacked by *Brachyderes incanus*, L., which feeds on the edges of the needles, giving them a serrated appearance. *Pteronus* (*Pteronidea*) *miliaris*, Panz., is believed to have been the cause of injury to the buds on small twigs of willow. The infestation of oaks, elms, limes and other trees by the brown-tail moth [*Nygmia phaeorrhoea*, Don.] was less severe than in previous years. A polyhedral disease destroyed many of the larvae in the spring, and two Hymenopterous pupal parasites, *Monodontomerus aereus*, Wlk., and *Pimpla instigator*, F., were observed in numbers. *M. aereus*, however, is sometimes a hyperparasite of *Nygmia*.

Euxoa (*Agrotis*) *nigricans*, L., which is usually a pest of cereals, *Pegomyia hyoscyami*, Panz., and *Hylemyia fugax*, Mg., occurred on beet. The first generation of *P. hyoscyami* was far less numerous than in previous years, this being partly due to heavy rain at the end of April. An extract from a report of the Commission for Sugar-beet Cultivation in the Province of Groningen is reproduced and records the occurrence of three generations of the fly in 1930. It caused most

injury to beet grown near to plots severely infested by it in the preceding year. Fields near the sea suffered more than those farther inland, and low-lying and sheltered plots less than those on higher ground.

ZACHER (F.). **Die Bekämpfung der Kirschenmade.** [The Control of the Cherry Fly.]—*Mitt. Ges. Vorratsschutz,* vii, no. 5, pp. 53–55. Berlin, September 1931.

Rhagoletis cerasi, L. (cherry fly) occurs in Europe from Kurland to Italy, but not in England or Scandinavia. Considerable loss accrues to the preserves industry in Germany owing to claims for the occurrence of dead maggots, and a further loss results from cherry import restrictions operating in other countries. For domestic use cherries can be freed of most of the maggots by soaking in cold water, but as the fruits swell this method is not suitable for factory practice. The author has therefore tested the effect of exposure for 24 hours to carbon dioxide, oxygen or nitrogen in sealed jars, the results being compared with those of exposure to air and to water in open containers. Exposure to nitrogen caused 60 per cent. of the maggots to leave the fruits, the percentages for the other substances being : water, 44·44 ; oxygen, 28·95 ; air, 8·33 and carbon dioxide, 6·9.

RUHDOLF (L.). **Frassgänge von Speckkäferlarven in Flaschenkorken.** [Mines of Lard Beetle Larvae in Bottle Corks.]—*Mitt. Ges. Vorratsschutz,* vii, no. 5, pp. 55–56, 1 fig. Berlin, September 1931.

Bottle corks in a cork factory at Hamburg were found to be mined by the larvae of *Dermestes lardarius,* L., for the purpose of pupation. The infestation is thought to have originated from animal products [*cf. R.A.E.*, A, xix, 404].

TOMASZEWSKI (W.). **Blüten- und Samenschädlinge an Nutzgräsern.** [Flower and Seed Pests in Useful Grasses.]—*Mitt. Ges. Vorratsschutz,* vii, no. 5, pp. 56–58. Berlin, September 1931.

This is a review of records of the occurrence in various parts of the world of mites and insects damaging the flowers or seeds of useful grasses.

JENSEN (K.). **Der Hausbock.** *Hylotrupes bajulus* **L.** (*Callidium bajulum*).—*Mitt. Ges. Vorratsschutz,* vii, no. 5, pp. 61–62. Berlin, September 1931.

Some of this information on infestation of timber in houses by *Hylotrupes bajulus,* L., in Denmark has already been noticed [*R.A.E.*, A, xix, 379]. Examination of over 1,000 houses infested by it has shown that it has a larval period of 4–5 years. The pupal stage requires 2–3 weeks. The flight period usually lasts from mid-July to mid-August but may begin earlier, fresh exit holes having been observed in April, and last until September. Infestation is spread by flight of the beetles, and very rarely through introduction in constructional timber.

Silvestri (F.). **La difesa integrale dell'agricoltura.** [The essential Defence of Agriculture in Italy.]—*Atti Raduno Tecnici agric. Mezzogiorno e Isole d'Italia, Portici, 29–30–31 Marzo 1931*, reprint 6 pp. Naples, 1931.

This is a plea for the development of entomological institutions in Italy, where it is estimated that an annual loss of over £12,500,000 is caused by insect pests.

de Mel (C. N. E. J.). **Habits and Control of the Coconut Black Beetle** (*Oryctes rhinoceros* **L.**).—*Trop. Agriculturist*, lxxvii, no. 2, pp. 99–111, 12 refs. Peradeniya, August 1931.

Until recently the losses caused to coconut in Ceylon by *Oryctes rhinoceros*, L. [*R.A.E.*, A, x, 582, xvii, 568] were usually considered negligible, and the factors responsible for its increase are discussed. The damage experienced in other countries is reviewed from the literature. The problem of this Dynastid in Ceylon centres mainly on its breeding-places, which consist of dead and decaying coconut logs, cattle manure and refuse of various kinds and are discussed in some detail. Moisture is a necessary condition in the breeding material, but the larvae cannot exist in sodden or water-logged conditions. Coir dumps at fibre mills were found to be free from infestation, but larvae may occur in the decaying humus round the edges of the heaps and in drains silted up with coir dust and vegetable matter. Coconut husks may be buried in any soil as long as no woody material is incorporated ; they are of value for humus in light soils, in which woody material should not be buried. Trenches in which cuttings of *Tephrosia candida* were buried for green manure were free from infestation after two years.

Dead trees should be felled and the crown severed, the cabbage burnt and the trunk cut into logs, which should then be split in four. Manure heaps should be disposed of within three months, the pests present being burnt. Vegetable refuse and town garbage should not be buried on light, porous soils and on heavier soils should be covered immediately with a foot or more of well-pressed soil. On light soils vegetable matter alone may be scattered in thin layers and covered in with a harrow to form a mulch. Fallen coconut branches, etc., may be used as a surface mulch on sandy soils after the thick woody portions have been removed and burnt. The ashes have a manurial value. The practice of burying logs to attract the ovipositing females is undesirable ; a simple trap may be made by placing a thick layer of cattle manure at the bottom of a shallow pit and covering it with 6 ins. of straw. The pit should be re-made and the insects destroyed every two months.

van der Meer Mohr (J. C.). **Entomologische Aanteekeningen, I. A. Over leemnestjes op tabaksbladeren. B. Over samenklontering van tabakszaad. C.** *Dinoderus minutus* **Fabr. in tabak.** [Entomological Notes, I. A. Mud-nests on Tobacco Leaves. B. The Clotting of Tobacco Seeds. C. *D. minutus* in Tobacco.]—*Meded. Deli Proefst.*, (2) lxxi, pp. 1–10, 3 pls. Medan, 1931. (With Summaries in English.)

Of these notes from Sumatra, the first deals with the nests of a mud-wasp, *Eumenes* sp., sometimes found on tobacco leaves [*cf. R.A.E.*, A,

xviii, 333]. The nests contain caterpillars, but not of species that are pests of tobacco. The second describes a clotting together of tobacco seed, probably caused by the mite, *Tyroglyphus* (*Tyrophagus*) *putrescentiae*, Schr., infestation by which does not occur in carefully stored, dry seed. The third states that specimens of *Dinoderus minutus*, F. (bamboo shot-borer) have been received from tobacco fermenting sheds together with some fermented leaves damaged by them. It is presumed that the leaves became infested in the shed, as they are hung on bamboos, some of which may have contained this Bostrychid.

Pagden (H. T.). **Two Citrus Borers.**—*Sci. Ser. Dept. Agric. S.S. & F.M.S.*, no. 7, pp. 1–16, 9 figs., 8 refs. Kuala Lumpur, 1931.

The Tineid, *Prays endocarpa*, Meyr., and the Pyralid, *Citripestis sagittiferella*, Moore (which appears to have been erroneously recorded from Malaya and elsewhere as *Nephopteryx* or *Crocidomera robusta*, Moore [*R.A.E.*, A, xii, 36, 379; xiv, 521], the latter moth belonging to the genus *Hypsipyla* and not attacking *Citrus*) sometimes cause considerable damage to limes, lemons, grapefruit and oranges in Malaya. The stages of both insects, with the exception of the pupa of *C. sagittiferella*, are described.

The eggs of *P. endocarpa*, which are usually laid singly in depressions of the oil glands of the fruit, hatch in about 5 days, and the larvae immediately eat into the rind, causing galls in it. Ultimately a considerable amount of lignified tissue is formed round the seat of the damage and may extend to the pulp and render the fruit unfit for consumption, though the juice can still be used. After about three weeks, the larvae pupate, in a silken web on the fruit or more usually on a leaf or twig, the pupal period averaging 4·25 days. Oviposition begins on the fourth day after emergence. Some females kept in captivity for three weeks laid approximately 100 eggs. The Eulophid, *Euderus malayensis*, Ferrière [xix, 28] is an ectoparasite of the larvae. Control measures have not given wholly satisfactory results; stomach poisons against the larvae are useless, and bagging the fruit would not be economically justified. If spraying is resorted to, a contact insecticide such as kerosene emulsion should be used to kill the mature larvae that have left the fruit or the pupae. It should therefore be applied as soon as galls with holes in them are numerous, and repeated in 7 days and again in 14. Though spraying will not kill all the larvae, owing to the overlapping generations, the damage will undoubtedly be reduced. The fruits that are the worst infested should be picked and destroyed before the galls have holes in them.

The life-cycle of *C. sagittiferella* from egg to adult lasts 23–30 days. The eggs are laid in an irregular mass, in a row of three or more or occasionally singly, and hatch in 5–6 days. The larvae, after wandering over the surface of the fruit, bore into the rind and subsequently feed on the pulp and seeds. They weave a silken tube round themselves as they progress, which probably forms a protection against the juice of the fruit. The pupal period is passed in the soil and occupies 9–11 days. A Braconid, possibly *Chelonus* sp., and a Tachinid, which is more numerous, have been bred from the larvae.

The larval habits would permit the application of a stomach insecticide, but the experiments of other workers have shown that lead arsenate affects the flavour of *Citrus* fruit, and such materials as derris only retain their toxicity for a short time after application. In

serious outbreaks, the damaged fruit should be collected and destroyed or placed in parasite boxes covered with wire gauze of about 3 mm. mesh and containing a layer of earth or sand in which pupation may take place. Infested fruit if left on the tree not only constitutes a further source of infestation but also attracts fruit-flies such as *Dacus ferrugineus*, F. Small scale experiments were carried out with geraniol and oil of limes as attractants for adults of *P. endocarpa* and *C. sagittiferella*, but positive results were only obtained with oil of limes and *C. sagittiferella*. It appeared to stimulate egg production and attracted the females, which normally lay their eggs exclusively on the rind of the fruit, to oviposit on or near a leaf or piece of paper painted with it. The moths are apparently not attracted to lights.

MILLER (N. C. E.). *Coccus* (*Lecanium*) *viridis*, **Green. The "Green Scale" of Coffee.**—*Sci. Ser. Dept. Agric. S.S. & F.M.S.*, no. 7, pp. 17–29, 5 figs., 15 refs. Kuala Lumpur, 1931.

Coccus viridis, Green, is present in every country where coffee is cultivated and is a serious pest in some of them. Its increase and spread appears to be regulated more by climatic conditions than by insect enemies. Periods during which there is almost daily precipitation are unfavourable to it, and in view of the comparatively short dry periods in Malaya, the chances of its becoming a major pest are remote. The egg, newly hatched larva and adult female are described. The plants attacked in Malaya include *Bassia latifolia*, *Achras sapota*, limes, and possibly *Funtumia elastica*. Of the varieties of coffee, *Coffea robusta* and *C. excelsa* appear to be preferred. The position adopted by the scales on the food-plant varies, though preference is shown for the lower surface of the leaf, close to the midrib or branch veins. Sexual maturity is reached in about 68 days.

C. viridis is fostered by the ant, *Oecophylla smaragdina*, F., which is attracted to its sticky excrement and prevents the growth on it of a sooty brown fungus (*Capnodium brasiliense*), which if not checked may eventually envelop and kill many scales. The parasites bred from the scale in Malaya, brief notes on which are given, are *Encyrtus flavus*, How., and the Eulophids, *Coccophagus* sp. and *Aneristus ceroplastae*, How., but the percentage of parasitism in nature appears to be very low. The Coccids have also been found to be attacked by a fungus of the genus *Fusarium*.

An emulsion of 4 pints kerosene, 2 pints water and $\frac{1}{4}$ lb. soap, diluted with 7 parts water, is effective for control, and has caused no foliage injury. Pyrethrum sprays have also been used with success. Ants should be destroyed on the bushes and kept off them by bands of sacking soaked in a mixture of resin and castor oil boiled together.

HADDEN (F. C.) & LOPEZ (A. W.). **Efforts towards biological Control of the Common Pink Mealybug** *Trionymus sacchari* (**Cockerell**) **of Sugar Cane on Negros.**—*Philipp. J. Sci.*, xlvi, no. 2, pp. 221–223. Manila, October 1931.

Trionymus sacchari, Ckll. (pink mealybug) has recently increased on sugar-cane in Negros owing, perhaps, to the effect of an unusually dry rainy season on the growth of a fungus of the genus *Aspergillus* that is of considerable importance in its control. A Coccinellid,

Scymnus (*Pullus*) sp., and an Encyrtid, *Anagyrus* sp., have been introduced from Luzon, and each liberated in colonies of 40–100 in various severely infested fields. Owing to its small size the Coccinellid is able to attack *T. sacchari* between the leaf-sheath and the stalk, where it is commonly found. Its life-history is completed in about a month. The Encyrtid oviposits in the mature or nearly mature Coccids, the larvae probably devouring the entire body contents. In the Philippines its life-history occupies 12–16 days. Efforts are being made to establish this parasite against *T. sacchari* in Hawaii.

LINFORD (M. B.). **Streak, a Virus Disease of Peas transmitted by** *Thrips tabaci* (**Abstract**).—*Phytopathology*, xxi, no. 10, p. 999. Lancaster, Pa., October 1931.

A disease of peas (*Pisum sativum*), the symptoms of which are described and which is characterised by a streaked and spotted brown necrosis of pods, stems and leaves, was observed to be widely distributed throughout the United States in 1928. No micro-organism has been found associated with it. During investigations on pineapple yellow spot disease in Hawaii, infected individuals of *Thrips tabaci*, Lind., were transferred to peas from infected plants of the weed, *Emilia sagittata* (*flammea*) [*cf. R.A.E.*, A, xix, 316]. Symptoms developed that appeared identical with streak disease of peas and that do not follow feeding of non-infective thrips, 21 of 45 plants becoming infected. Individual thrips have transmitted infection. Those reared on infected peas have transmitted to peas, reproducing streak, and to pineapple, producing typical yellow spot. In peas the incubation period is about 12–20 days. Streak caused by the yellow spot virus occurs in market garden plantings in Honolulu. It is suggested that streak in the United States is caused by either this or a related virus.

LINFORD (M. B.). **Further Studies of Transmission of the Pineapple Yellow-spot Virus by** *Thrips tabaci* (**Abstract**).—*Phytopathology*, xxi, no. 10, p. 999. Lancaster, Pa., October 1931.

Further studies on the transmission of yellow spot disease of pineapple by *Thrips tabaci*, Lind., in Hawaii [*cf. R.A.E.*, A, xix, 316, 648] have revealed a specialised relationship between the virus and insect. *Emilia sagittata* (*flammea*) was the chief test plant, supplemented by pineapple and others. The thrips were taken from three non-infected colonies, each reared from an individual larva. The virus, which is transmitted both by adults and large larvae reared on infected plants, survives pupation and can be transmitted by a single individual. Adults from non-infective colonies allowed to feed upon diseased plants appear never to become infective, but larvae become infective and are able to transmit the disease even as adults. The failure of adults to become infective has been shown consistently in tests with four species of plants as the source of virus. In the larvae there is an incubation period lasting approximately 10 days. The virus is not readily transmitted by mechanical means. Host plants of the yellow-spot virus include members of several unrelated families.

TAKAGI (G.). **Studies with the Control of the Larch-sawfly.** [*In Japanese & English.*]—*Bull. For. Expt. Sta. Govt.-Gen. Chosen*, no. 12, 78+35 pp., 8 pls., 39 tables, 16 figs., 1 graph, 1 map, 43 refs. Keijo, Chosen, March 1931.

The Tenthredinids, *Pachynematus laricivorus*, sp. n., *P. nigricorpus*, sp. n., and *Diprion koreana*, sp. n., which are described, have caused severe injury to larch (*Larix dahurica* var. *coreana* and *L. kaempferi*) in the north of Korea.

A detailed account is given of the bionomics of *P. laricivorus* as a result of studies since 1926. Emergence begins at the end of May and lasts for about a month, the maximum usually occurring in early June and continuing for about 10 days. Mating takes place 1 or 2 days after emergence, and the eggs are deposited in the young terminal shoots of trees up to 15 years of age. In the laboratory, females laid 4–40 eggs, which usually hatched in 7 days. Reproduction may take place parthenogenetically. The newly-hatched larvae attack the edges of the leaves, but the older ones eat the entire leaf. When many eggs are deposited in one shoot it usually dies, and in the case of a terminal shoot the tree is deformed. The larvae rarely migrate and often kill the tree. They hibernate usually in cocoons, which they spin about mid-June, at a depth of 3–6 cms. in the ground, between the roots of trees or among grasses, and pupate 2 weeks before they emerge in the spring. Adults emerged from 30 per cent. of cocoons exposed to an average temperature of from 0 to about $-12°$ C. [32–10·4° F.] when left on the ground from December to April.

Seven new Ichneumonids attacking the larvae of this sawfly are described by Uchida, *viz.*, *Monoblastus takagii* (with var. *nigrianalis*), *Microcryptus chosensis*, *M. rufibasalis*, *Homocidus akaashii*, *Spilocryptus tricolor*, *S. macroincubitor* and *Stylocryptus lygaeonematus*. The first four oviposit in the larvae in the beginning and middle of June before they have spun their cocoons, and the last three in the middle of June after the cocoon has been spun. *Cleptes semiauratus*, L., attacks the larvae in the cocoons after the end of June, the highest rate of parasitism occurring at a depth of 3 cms. All these parasites remain within their host till the following year. Other natural enemies include a Pteromalid, *Coelopisthia* sp., an Ichneumonid, *Pimpla* sp., spiders and birds. Owing to the activities of the parasites, of which *Cleptes*, *Stylocryptus* and *Monoblastus* are the most important, large infestations have decreased and the trees have completely recovered.

The bionomics of *Pachynematus nigricorpus* appear to be very similar to those of *P. laricivorus*, and these species cause greater damage than *D. koreana*. The adults of the last-named appear in the beginning or middle of June and oviposit on the lateral verticils left by *P. laricivorus*. The larvae feed on the leaves of the lateral shoots and spin cocoons on the branches in July.

For control, hand-picking of the eggs, larvae and cocoons is useless and often injures the tree. A dust of 112 parts (by weight) of pyrethrum powder and 262 of ashes gave 100 per cent. control in the laboratory and one of 56 parts of lead arsenate and 321 of sulphur powder gave 80 per cent., but their application in the field would be most expensive and entail many difficulties. The author recommends further studies designed to increase the numbers of the natural enemies and the resistance of the trees.

Takahashi (R.). **Some White-flies of Formosa.**—*Trans. Nat. Hist. Soc. Formosa*, xxi, no. 115, pp. 203–209, 3 figs. Taihoku, Formosa, August 1931.

Brief notes are given on seven species of Aleurodids in Formosa of which three are new and are described from the pupal cases. They include *Bemisia gossypiperda*, Misra & Lamba, on cotton (*Gossypium* sp.), *Dialeurodes citri*, R. & H., which is common on *Citrus* and other plants but is not of economic importance in Formosa, and *Aleurocanthus cinnamomi*, sp. n., which is common on camphor (*Cinnamomum camphora*).

Clausen (C. P.). **Insects injurious to Agriculture in Japan.**—*Circ. U.S. Dept. Agric.*, no. 168, 115 pp., 1 map, 212 refs. Washington, D.C., August 1931.

This publication presents a valuable résumé of the published data available to the end of 1926 on the various insects attacking fruit, field and garden crops and forest trees in the Japanese Empire. It comprises lists of the pests of each kind of crop, showing their food-plants and distribution, and brief notes on the bionomics and control of large numbers of the more important ones, with references in each case to the literature on which the information is based. A full index to the many species concerned is appended.

Bates (M.). **Informe mensual sobre los Insectos de Guatemala.** [Monthly Report on the Insects of Guatemala.]—*Bol. Agric. y Caminos Guatemala*, x, no. 7, pp. 254–259, 3 figs. Guatemala, July 1931.

In the Antigua district of Guatemala coffee has been damaged by the wounds made for oviposition by a Gryllid, probably *Paroecanthus guatemalae*, Sauss. It usually oviposits at the base of old trunks, only doing so in new wood when it is very abundant, or when the shoots are quite close to the ground.

Wildermuth (V. L.) & Davis (E. G.). **The Red Harvester Ant and how to subdue it.**—*Fmrs'. Bull. U.S. Dept. Agric.*, no. 1668, 21 pp., 14 figs. Washington, D.C., August 1931.

Pogonomyrmex barbatus, F. Smith (red harvester ant), all stages of which are described, causes considerable loss in cultivated fields and orchards in the south-western United States, where colonies of these ants clear circular areas, often as much as 25–35 ft. in diameter, in lucerne or grain fields. A 20-acre field may have the equivalent of 100 average-sized colonies, involving the wastage of a quarter of an acre of land. The ants also cause direct loss to seed crops by collecting seed for storage both from growing plants and when freshly sown in the ground. A popular description is given of the habits of the ants and the structure of their nests, which sometimes extend to a depth of 15 ft., rendering control extremely difficult. In porous soil the general shape of the tunnelled area is that of an inverted

cone 8–10 ft. in depth, but the ants are sometimes checked by a hard layer of soil or a high water table, in which case the nest tends to spread laterally.

The barren circular area is the result of the activity of the workers in cutting down any vegetation that attempts to grow there, the presence of which by shading the colony would increase the amount of moisture and lower the temperature within the nest. Colonies ordinarily survive for several years; one has been under observation for 19 years and is still active. Although females may fly for considerable distances, the greater number of new colonies, which are most easily formed in porous soil, are established within a radius of a few hundred feet from the old one. The food stored by the ants consists of a wide variety of seeds and renders control more difficult, as it enables them to close up the entrance tunnel and live for months without giving signs of activity.

No treatment that does not kill the queen will result in permanent destruction of the colony. Of the numerous measures discussed, carbon bisulphide poured into the various tunnels, a 6-inch layer of topsoil having been removed, preferably the previous day, destroys a colony most quickly and thoroughly. The treatment should be applied in spring or autumn and never at midday. The same chemical poured directly into the entrance hole frequently gives good results, but it is often necessary to repeat the treatment. The application of ½ oz. London purple in a ring not more than 1½ ins. wide and about 4 ins. in diameter around the entrance hole is a cheap method of control and gives good results when used at least three times at intervals of 10–12 days, or more frequently if necessary. This treatment may have to be continued for one or two seasons, or possibly longer, to rid a field of the ant colonies present. It should always be applied when the ants are active, preferably during late spring or summer. Calcium cyanide sprinkled about the entrance hole suspends the activities of the ants for a period of about a week or more.

HAMLIN (J. C.), REED (W. D.) & PHILLIPS (M. E.). **Biology of the Indian-meal Moth on Dried Fruits in California.**—*Tech. Bull. U.S. Dept. Agric.*, no. 242, 26 pp., 1 fig., 22 refs. Washington, D.C., September 1931.

Serious losses are caused to the dried-fruit industry by *Plodia interpunctella*, Hb. (Indian meal moth), which is distributed practically throughout California, owing to the reduction in the quality of the fruit and the extra expense entailed in cleaning processes. Investigations, the results of which are given in detail, were carried out from 1925 to 1927 to discover the rates of development on raisins, prunes and figs and to determine the rate of multiplication, the life-history and seasonal relations. The stages are described. *Microbracon hebetor*, Say (*Habrobracon juglandis*, Ashm.), which attacks the larvae, is the most abundant of the parasites, though it is not of sufficient importance to control infestations without remedial measures. *Nemeritis canescens*, Grav., is an occasional parasite. A single female of *Epigrymyia* (*Drepanoglossa*) *floridensis*, Tns., was collected, and four adults of this Tachinid were reared from a larva of *P. interpunctella*.

The following is taken from the authors' summary: The eggs are laid on the surface of the dried fruit not more than 3 days after emergence, oviposition continuing for 1–18 days. Females laid 39–275

eggs, the average for the entire season being 152·3. The larvae feed on the surface of dried fruits in storage, giving them an unsightly appearance. The average larval period is shorter on figs than on raisins or prunes, probably owing to the higher sugar and moisture contents of the former. An increasingly large proportion of the larvae of the third, fourth and fifth generations overwinter, and in consequence the larval period lasts 13–288 days. The pupal period lasts 4–33 days, pupation occuring chiefly in March. The shortest life-cycle from egg to adult was 27 days on figs, and the longest was 305 on prunes, that on raisins varying from 33–302. There was a maximum of 5 generations a year on raisins and 4 on prunes ; on figs there would probably be more than 5. The generations overlap considerably, owing to the method of hibernation, the length of the larval period and the varying duration of certain stages according to the temperature.

Kelly (S. G.). **The Control of Noogoora and Bathurst Burr by Insects.**—*J. Council Sci. Ind. Res.*, iv, no. 3, pp. 161–172, 25 refs. Melbourne, August 1931.

A detailed account is given of investigations in Kansas during 1929–30 on insects attacking local species of *Xanthium*, with a view to their possible introduction into Australia for the control of Noogoora and Bathurst burrs [*X. pungens* and *X. spinosum*]. The literature on these insects is briefly reviewed.

The larvae of the Trypetid, *Euaresta aequalis*, Lw., which has been sent to Australia [*R.A.E.*, A, xix, 116], infest the seeds of *Xanthium*, and have never been recorded from any other plants. The first adults emerged early in August, and the flies were prevalent on the plants until mid-September. Mating began on 19th August, and oviposition occurred in the green burrs when they were fully developed, but before they became hardened. The percentage of infestation of a total of about 16,000 burrs (corresponding to nearly 32,000 seeds) collected in 21 different localities varied from 2·8 to 50·6 and averaged 26·85. Infestation was low among plants growing on sandy soil, as the high temperature of such soils is unfavourable to the flies, and the percentage of infested burrs in a locality with an annual rainfall of 36 ins. was 17·6 as against 50 in one with a rainfall of 26 ins. It was necessary to modify the time of emergence of the adults to correspond with that of the forming of the burrs in Australia, which occurs during March or April. This was successfully achieved by subjecting infested burrs to cold during November, and forwarding them on 5th December. In experiments the flies did not oviposit on *Datura*, *Centhrus*, sunflower (*Helianthus*) or strawberry.

The larvae of the first generation of *Epiblema strenuana*, Wlk., cause galls in the stems of *Xanthium*, without doing any great injury to the plants. The adults emerge in August. Larvae of the second generation do not cause galls, but tunnel in the stems, thus weakening the plants. They become fully grown in September, hibernate in the stems and pupate in the following May, the resulting adults emerging early in June. None of the plants was killed by this Tortricid, but badly infested ones bore only about one-fifth as many burrs as uninfested plants. The moth has been reared from stems of ragweed

(*Ambrosia*), but so far no evidence has been found of it attacking economic plants.

Observations on *Rhodobaenus tredecimpunctatus*, Ill., the bionomics of which are briefly discussed, show that although oviposition tests on a number of plants of economic importance gave negative results, the adults fed readily on all of them, and one larva successfully completed its development on sunflower [*cf.* xviii, 644]. Its introduction into Australia is therefore considered undesirable. Another weevil, *Baris callida*, Casey, may, however, prove of great value since it only occurs on *Xanthium*. The eggs are laid, probably on the roots, during June. The larvae bore into the roots and tunnel just beneath the bark, as many as 11 being found on one plant. Plants large enough to bear about 500 burrs were killed before any of them matured. Pupation occurs in the roots during September, and some of the adults emerge during that month and in October, though many remain in the pupal cells throughout the winter. Negative results were obtained with the adults in oviposition and starvation tests on *Ambrosia*, sunflower and *Aster*. The bionomics of *Baris xanthii*, Pierce, are nearly identical with those of *B. callida*. Counts in a plot of *Xanthium* during mid-August show that 47 per cent. of the plants were killed by this weevil. During the autumn the adults of both species feed on the tender parts of the plants at the base of the green burrs, cutting off some of the burrs in the process. *B. xanthii* was not found on plants other than *Xanthium*, and attempts to force it to feed on sunflower failed. The larvae of *Apion melanarium*, Gerst., cause galls in the stems of *Xanthium*, and the adults feed on the tender parts of the plants. No tests have been conducted to determine whether other varieties of plants are attacked.

The adults of the Lamiid, *Hippopsis lemniscata*, F., which was found in small numbers, appear in June and oviposit in the stems. The larvae develop throughout the summer and hibernate in the lower part of the stem, pupating late in the following May. The plants are weakened as a result of infestation, a large percentage dying without producing seed. Before the burrs are mature, the larvae prune the plants about 1 ft. above the ground, many of the burrs being cut off. The larvae of *Dectes spinosus*, Say, the bionomics of which are similar to those of *H. lemniscata*, bore in the upper parts of the stems during the time of formation of the burrs, and many of the latter die before ripening. They also prune the plants near the surface of the soil during November and hibernate in the roots. Adults confined with artichokes did not oviposit on them. The life-cycle of *Ataxia hubbardi*, Fisher, resembles that of the other two Lamiids; the larvae do not prune the plants, though many may be killed by them. Hibernation is passed in the larval stage in the lower part of the stems.

MARLATT (C. L.). **Report** [1929–30] **of the Chief of the Bureau of Entomology.**—76 pp. Washington, D.C., U.S. Dept. Agric., 1930. [Recd. October 1931.]

The work of the United States Bureau of Entomology for the year 1929–30 is reviewed, and detailed reports are given of the investigations that are being carried out by the various Divisions throughout the country. Much of the information given has already been noticed from other sources.

Recent studies of the Japanese beetle [*Popillia japonica*, Newm.] indicate that pupation is either completely inhibited or excessively prolonged when temperatures fail to reach 65° F., no matter how far advanced the larvae may be at the time of entering hibernation. Studies of the egg and pupa indicate that the time required for development under constant temperatures coincides with the mean of the times required under variable temperatures, but only in cases where the range of variable temperatures lies above that at which development begins. As the result of work to determine the efficiency of immersing the subterranean portion of dormant nursery plants in water at a temperature of 112° F. to destroy the immature stages of *P. japonica*, this treatment is recommended for use in the case of certain herbaceous plants and deciduous shrubs. It has been demonstrated that 3-year-old plants of *Azalea indica* can be fumigated with carbon bisulphide by immersing the tops of the plants in water to protect them from the gas while the roots are exposed to the insecticidal vapour.

Out of a total of 32 stomach poisons investigated by the sandwich method [*R.A.E.*, A, xviii, 311] as to their relative toxicity to insects, only two, manganese arsenate and p-nitrosodium-ethylanaline, appear to deserve further study. Studies of the action of the high-frequency electrostatic field on insects showed that a field having a frequency of 25 metres and a flow of 4–6 ampères killed insects only on long exposure, whereas it killed or seriously injured growing plants within a few minutes. The electrostatic field apparently affects the organism by raising the tissues to a high temperature. Experiments with hot water treatment for fruit stock infested with the oyster shell scale [*Lepidosaphes ulmi*, L.] or the San José scale [*Aspidiotus perniciosus*, Comst.] indicate that *L. ulmi* can be destroyed by immersion in water at 112° F. for 30 minutes or at 120° F. for 20 minutes. *A. perniciosus* was not killed at 112° F. but succumbed at 120° F. Apple, peach and pear stocks were immersed successfully while dormant for periods of time sufficient to kill insects, but plum, quince and cherry stocks were severely damaged. Tests of lime-sulphur and various oil sprays against *Chrysomphalus obscurus*, Comst., a scale that attacks pecan and appears to have only one generation a year, have demonstrated that it is not controlled by any of the dormant applications effective against many other Diaspine Coccids. A considerable reduction in oviposition of weevils [*Curculio* spp.] in chestnut burrs [xviii, 113] has been effected by the application to the trees of a heavy whitewash of hydrated lime, which acts as a repellent to the adults. Treated trees produced 75 per cent. sound nuts as compared with 33 per cent. on untreated ones. Favourable results have also been secured by treatment of the soil with carbon bisulphide and with ethylene bromide for destruction of the larvae.

Potassium fluosilicate appears to be a promising substitute for lead arsenate in the control of plum curculio [*Conotrachelus nenuphar*, Hbst.]. No fruit injury and practically no injury to foliage occurred on peach trees that received four applications of potassium fluosilicate, 2 lb. to 50 U.S. gals. without lime. The fact that lime contributes to injury from this material, however, complicates the use of sulphur-lime fungicide for peach diseases.

During the summer of 1929 rather severe damage to lucerne by the alfalfa weevil [*Hypera variabilis*, Hbst.] occurred in Oregon, 200 miles from the nearest known infestation. This is the first known

spread west of the Cascade Mountains, and the weevil has developed habits in the new environment quite different from those in the older infested area.

About 25,000 individuals of *Perisierola cellularis* var. *punctaticeps*, Kieff., a parasite of the pecan nut case-bearer [*Acrobasis caryae*, Grote] and the pecan shuckworm [*Enarmonia caryana*, Fitch] were bred and liberated during 1929. The first importations of *Microbracon kirkpatricki*, Wlkn., were made early in 1930 with a view to determining the possible value of this parasite against the pink bollworm [*Platyedra gossypiella*, Saund.] in the United States.

In continued studies of the larch sawfly [*Lygaeonematus erichsoni*, Htg.] on tamarack [*Larix laricina*] [*R.A.E.*, A, xviii, 379], the number of eggs laid was found to depend to a considerable degree on the stage of development of the tree at the time of oviposition, the females refusing to oviposit unless the new growth is ½ inch or more in length, even though they die without ovipositing. The number of eggs laid increases in proportion to the length of the new growth until a growth of about 2 inches has been reached, after which there seems to be no further increase. The growth of the trees appears to be reduced in direct proportion to the degree of defoliation. A considerable acceleration of growth occurs in the first year of defoliation, and a rapid decline follows, ending in death at the end of the third year.

Strickland (E. H.). **Relative Susceptibility of Wheat Varieties to Wireworm Damage.**—*Sci. Agric.*, xii, no. 2, pp. 88–91. Ottawa, October 1931.

Observations made in 1930 in connection with the feeding habits of *Corymbites* (*Ludius*) *aeripennis*, Kby. (northern grain wireworm), which is the most prevalent species in the grain fields of Alberta, indicated that seedlings of the Garnet variety of wheat are less able to withstand attack than are those of Marquis or Reward varieties. In experiments in 1927, it was found that Garnet was slightly less infested than either Marquis or Ruby, but the subsequent experiments showed that although Garnet was not attacked in the seedling stage more heavily than other varieties, infested plants failed to make any recovery whereas several of those of both Marquis and Reward, though showing signs of damage, ultimately survived and produced heads. Field data, collected over a considerable period, indicate that the relative reduction in yield between Garnet and Marquis as the result of extensive wireworm feeding is more marked in certain years than in others, but combined with the results of experiments they suggest the advisability of sowing fields known to be heavily infested by wireworms with Marquis or Reward wheat in preference to Garnet.

Insects of the Season 1930.—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 7–32. Toronto, 1931.

Notes are given by various authors on a large number of insect pests observed in the different Provinces of Canada during 1930. K. M. King, E. McMillan and K. E. Stewart (pp. 23–27) report that in Saskatchewan the outbreak of *Porosagrotis* (*Agrotis*) *orthogonia*, Morr.,

was by far the most extensive that has ever occurred in that Province and tl at commercial damage occurred at points as much as 150 miles beyond the previously recorded limits of its economic distribution. It is estimated that on an average about half the field crops sown before 20th June were destroyed by it in certain localities in the south-central part of the Province.

Pettit (R. H.) & Hutson (R.). **The Insect Situation in Michigan.**—*61st Ann. Rep. Ent. Soc. Ontario* ***1930***, pp. 33–35. Toronto, 1931.

During the past two years *Coleophora pruniella*, Clem. (cherry case-bearer) has become somewhat prevalent on cherries over a large area in Michigan [*cf. R.A.E.*, A, xix, 340]. The damage caused by it is aggravated by the fact that the overwintered larvae attack the opening foliage, and those of the first two instars are feeding during the period when the trees are storing up food for the next season. Outbreaks of *Scolytus rugulosus*, Ratz., occurred in orchards during the summer. Those investigated all took place where it had the opportunity of breeding in dying wood of various fruit trees. In several cases fruit and shade trees were damaged by *Chrysobothris femorata*, F. Tests in the field with a 6 per cent. lubricating oil emulsion [*cf.* xix, 545] against *Tortrix* (*Archips*) *argyrospila*, Wlk., which is becoming a serious pest in the fruit-growing regions in the western part of the State, gave 98 per cent. control. The chief problem in applying this spray is the difficulty of obtaining an adequate coverage of the highest parts of the trees. The economic status of the oriental peach moth [*Cydia molesta*, Busck] and its distribution throughout the State are briefly indicated.

Numerous reports were received during the summer of a mite causing injury to the foliage of raspberry, the fruit of which in some cases failed to ripen. In view of its injurious effect upon the plant, sulphur could not be used. Successful results were obtained by spraying, at a pressure of 200 lb., with a derrisol solution (1 : 800) with the addition of ivory soap at the rate of 4 lb. to 100 U.S. gals. water. A proprietary oil emulsion (1 : 30) was applied to Austrian pines [*Pinus nigra austriaca*] against *Toumeyella* (*Lecanium*) *numismatica*, Pettit & McD. [*R.A.E.*, A, xviii, 353] at a pressure of 400 lb., just before the new growth appeared on the trees, which is the time the overwintered scales recommence their development. Examination of the trees in the autumn revealed the presence of only a few live scales, whereas the controls were heavily infested.

Hall (J. A.). **Notes on the Palmer Worm** (*Dichomeris ligulella* **Hüb.**) **and the Red Banded Leaf Roller** (*Eulia velutinana* **Walker**).—*61st Ann. Rep. Ent. Soc. Ontario* ***1930***, pp. 38–41, 10 refs. Toronto, 1931.

Dichomeris ligulella, Hb., which caused considerable injury to apple in Ontario in 1901, was observed in orchards in Norfolk County in 1929, and was fairly numerous in 1930. Oviposition probably occurs on the lower surface of the leaves early in May, and the larvae hatch towards the end of the month. They feed for 25–30 days on the leaves, which they skeletonise, and young fruits before pupating in rolled leaves. The pupal period lasts about 14 days. The adults,

which are active at night, emerged throughout July 1930, and were taken in bait pans from 7th July to 11th August. *Eulia velutinana*, Wlk., all stages of which are described, caused some injury to apple in 1929. It had two generations and a partial third during the following year. Its seasonal life-history and the lengths of the stages are briefly discussed.

It would appear that both these moths are normally held in check by climatic factors, natural enemies and the usual orchard practices, but that under favourable conditions they may become pests of some importance.

HERMAN (F. A.). **Pyrethrum, the Location in the Plant of the potent Principle (Abstract).**—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 41–43. Toronto, 1931.

A number of extracts prepared with methyl alcohol from various ground samples of pyrethrum (*Chrysanthemum cinerariaefolium*) grown locally and harvested at different stages of development were tested in Ontario against the green apple aphis [*Aphis pomi*, DeG.]. It was found that the extracts from the blossom heads increased in toxicity as maturity was reached, whereas those from the stems decreased. Extracts from stems of plants in the small bud stage were more toxic than those from stems of plants with fully open flowers. Extracts from the stems were measurably less toxic than those from the buds. The following percentages of pyrethrin I were found: open flower, 0·3; stems from open flower, 0·04; semi-open flower, 0·25; and a commercial powder, 0·27.

CAESAR (L.). **Corn Borer Situation in Ontario in 1930.**—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 43–48. Toronto, 1931.

An account is given of the results of a survey conducted during the autumn of 1930 to determine the position with regard to the economic status of the European corn borer [*Pyrausta nubilalis*, Hb.] in Ontario [*cf. R.A.E.*, A, xix, 476].

STIRRETT (G. M.). **Preliminary Observations on the winter Mortality of the Larvae of the European Corn Borer in Ontario and Quebec.**—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 48–52, 3 refs. Toronto, 1931.

An account is given of observations carried out from 1927 to 1930 to determine the winter mortality of the larvae of *Pyrausta nubilalis*, Hb., in the various infested areas of Ontario and Quebec, and to ascertain whether there was a progressive increase in mortality towards the north. Heavily infested maize stalks were collected in Ontario and sent to the different localities, where they were placed in three situations, *viz.*, 6 ins. below the ground surface, on the ground, and above the snowline, and covered with wire gauze cages. The cages used for larvae on or below the ground were fitted with galvanised iron sides, which were pushed about 6 ins. into the soil to prevent the lateral escape of the larvae.

The following is taken from the author's summary: The winter mortality among larvae on the surface of the ground was about 6 per

cent., being the same as that normally found in the southern part of Ontario among larvae in natural positions in the field. The mortality among the buried larvae was considerably greater than among those on the surface throughout Ontario and Quebec, and was also greater than among those above the snowline for the major part of Ontario. Mortality above the snowline was about the same as that on the ground surface for the southern and central regions of Ontario. At certain points in northern Ontario and Quebec, however, all or almost all the larvae above the snowline were killed in certain years. The highest minimum temperature of a point at which all larvae were killed was —32° F.

Dustan (G. G.). **Further Notes on the Mortality and Feeding Habits of newly-hatched Oriental Peach Moth Larvae.**—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 52–57, 1 ref. Toronto, 1931.

Experiments in 1930 on *Cydia molesta*, Busck, on peaches, similar to those in 1929 [*cf. R.A.E.*, A, xix, 39], confirm more definitely that the varying resistance of the food-plant throughout the season, which increases up to the last week in August and drops off as the fruit ripens, is the primary factor responsible for the mortality of the newly hatched larvae. Meteorological conditions were not found to play any important part in directly affecting the mortality.

Steenburgh (W. E.). **The biological Control Factors affecting the Abundance of the Oriental Peach Moth** (*Laspeyresia molesta* **Busck) in Ontario during 1930.**—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 57–65, 3 refs. Toronto, 1931.

A detailed account is given of further investigations on the parasites of *Cydia* (*Laspeyresia*) *molesta*, Busck, conducted in Ontario during 1930 [*cf. R.A.E.*, A, xviii, 122, 494 ; xix, 41]. *Trichogramma minutum*, Riley, which is the only egg parasite of the moth found in the Province, and is not very abundant unless host eggs are plentiful, was not of great value in reducing its numbers during the season, though in one instance, on quince, the rate of parasitism reached 39 per cent. on 30th July, the highest figure for a native parasite for the season. The following native parasites were reared from larvae collected in the field, the figures in brackets showing their relative percentage to the total parasitism of the first and second generations: *Angitia* (*Dioctes*) *obliterata*, Cress. (33·3 and 10), *Cremastus minor*, Cush. (21 and 10), *Glypta rufiscutellaris*, Cress. (15·1 and 76·4), *Calliephialtes grapholithae*, Cress. (6·3 and 0), and a species of *Macrocentrus*, probably new (3·6 and 0), the last two being new to this host, *Apanteles* sp. (3·6 and 0), *Ascogaster carpocapsae*, Vier. (2·6 and 0·7), *Meteorus* sp. (1·3 and 0), *Glypta* sp. (1·3 and 0·7), *Microbracon* sp. (0·5 and 0), *Lixophaga plumbea*, Aldr. (0·5 and 0), unidentified species (2·0 and 1·1), *Pimpla* (*Epiurus*) sp. (0 and 0·7) and *Nemorilla maculosa*, Mg. (0 and 0·4). The total percentage of parasitism of larvae was 3·9 in the first generation and 11·5 in the second, the latter being the highest figure recorded since the introduction of *C. molesta*. The extremely low parasitism of 2 per cent. of the third generation may be explained by the fact that

the larvae were collected from areas where *Macrocentrus ancylivora*, Roh., was abundant, since a comparative study consistently shows that there are few native parasites where the latter is numerous.

A consignment of *Pristomerus vulnerator*, Panz., parasitising *C. molesta*, was received through the Imperial Institute of Entomology from the Italian and French Rivieras.

Colonisation of *Trichogramma minutum* was conducted during the season, the methods of liberation being similar to those used in 1929 [xix, 41]. A total of ten million parasites were liberated over an area of 200 acres in three localities at periods immediately prior to the peaks of egg-laying of the moths. Observations suggest that the abundance of host eggs is a much more important factor influencing the ultimate result of parasitism than the number of parasites liberated. The type of foliage and the exposure of the orchard to wind currents also seem to influence the activity of the parasite. Where *T. minutum* was released in large numbers, the percentage of injured fruit was much less than in the preceding year.

An examination of orchards where *Macrocentrus ancylivora* had been released in 1929 [*cf.* xviii, 494] showed that it had survived the winter and parasitised up to 22 per cent. of the larvae of *C. molesta*. In addition about 9,000 individuals, imported from New Jersey, were liberated between 18th June and 1st July, and these were followed by a further 2,191 that were locally bred and released in areas that had hitherto received no colonies. Work with this parasite has shown much promise. It has quickly availed itself of host material and has built up a very substantial population, destroying nearly 70 per cent. of the larvae in one locality during the season.

Reference is also made to *Chrysopa oculata*, Say, which is predacious on the eggs of *C. molesta* [xix, 527].

Baird (A. B.). **A brief Survey of the Organisation and Projects of the Belleville Parasite Laboratory.**—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 65–68. Toronto, 1931.

The author briefly indicates the important part played in economic entomology by biological control and some of the problems connected with it. A list of the pests against which work with parasites is being carried on in Canada [*cf. R.A.E.*, A, xix, 577] is included.

McLaine (L. S.). **The Blueberry Maggot Situation in Canada. A preliminary Report.**—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 68–69, 4 refs. Toronto, 1931.

Rhagoletis pomonella, Walsh, has been intercepted in blueberries imported into the United States from Canada during 1930. It has never apparently been found attacking them in the Dominion. It is considered that the control of this pest on blueberries in Canada would be difficult, since measures that are applicable in the United States, where the fruit is used for canning, are unsuitable in Canada, where there is no organised industry, the fruit being gathered by settlers in remote districts and sold fresh or chilled.

HAMMOND (G. H.). **The White Grub Situation in eastern Canada.**—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 69–73, 1 map. Toronto, 1931.

During recent years in eastern Canada, white grubs have caused very serious losses to farm and garden crops, as well as to conifer seedlings and apple stocks in nurseries. It was formerly thought that the common species, *Lachnosterna* (*Phyllophaga*) *anxia*, Lec., had a contemporary life-cycle through its range in eastern Ontario and over the principal agricultural sections of Quebec. Recent investigations, however, show that it has three well-defined cycle zones within a radius of 50 miles, each separated by possible physiographic barriers and each characterised by a more or less distinctive biological setting. Its distribution in the two Provinces is reviewed, and estimates of probable damage in future years are made. The effect in different localities of various factors, including parasites, of which *Tiphia inornata*, Say, and *Microphthalma michiganensis*, Tns., are the most important, and the fungus *Cordyceps* sp., is briefly discussed.

KEENAN (W. N.). **The Satin Moth in the Maritime Provinces.**—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 73–74. Toronto, 1931.

The distribution of the satin moth [*Stilpnotia salicis*, L.] in British Columbia and the United States is discussed [*cf. R.A.E.*, A, xix, 33] ; no further extension of the infested area occurred in British Columbia in 1930. In view of the annual eastward spread of the moth in the New England States, it had been anticipated that the Maritime Provinces would be invaded within a limited period, and in 1930 several centres of infestation were found in Nova Scotia and four in New Brunswick. In one of the latter, the pest was so abundant that it was found necessary to institute control measures against it.

SCHEDL (K.). **Notes on Jack Pine Sawflies in northern Ontario.**—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 75–79. Toronto, 1931.

During the past two years injury to Jack pine [*Pinus banksiana*] by sawflies has been reported from northern Ontario and eastern Quebec [*cf. R.A.E.*, A, xix, 577]. Although it was at first thought that only one species, probably *Diprion* (*Neodiprion*) *banksianae*, Rohw., was responsible for the injury, investigations in northern Ontario in 1930 revealed that two other unidentified species probably belonging to the same genus were also concerned. The larvae of the three sawflies are very briefly described. The black-headed Jack pine sawfly, which is probably *D. banksianae*, is common, but at present is of no great economic importance. The larvae, which hatch during the latter part of May from eggs laid during September in slits cut in rows along the edges of the new needles, become fully grown late in July or early in August. The adults appear during the latter part of August and the first half of September. The brown-headed Jack pine sawfly,

which was responsible for 30–40 per cent. of the infestation, hibernates as a prepupa in a cocoon in the ground litter. Pupation occurs in the latter part of May, and the adults appear during the second half of June. The eggs are laid in rows of slits on the foliage of the preceding season and hatch during the first half of July. The larvae feed upon the old foliage throughout July, August and the greater part of September. The bionomics of the twin-egg sawfly, which comprised from 60 to 70 per cent. of the species observed, are similar to those of the last-mentioned, but the adults begin to appear about 4 weeks later in the season. The eggs are laid singly in the new foliage, one egg-slit being usually made in each pair of needles. The larvae hatch about the end of July and are fully grown towards the end of September.

Sheppard (R. W.). **Notes on the Occurrence of the Pine Bud Moth (*Exoteleia dodecella* L.) in Welland County, Ontario.**—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 79–81. Toronto, 1931.

During the summer of 1928, pupae of *Exoteleia dodecella*, L., were found in the buds of pines in nurseries in Ontario, the infested buds being hollowed out, undeveloped and withered. This is probably the first record of the occurrence of this moth in North America. Scots pine (*Pinus sylvestris*) was the preferred food-plant, although other species, including mugho pine (*P. mughus*) and in one instance white pine (*P. strobus*), are also attacked. Observations in 1929 and 1930 indicated that the moth is entirely absent from the districts in which pines are grown to any appreciable extent. Although attempts to eradicate it in one locality in 1929 were successful, it was still quite prevalent in another in 1930. Natural enemies include a number of Hymenopterous parasites, one of which has been identified as *Pimpla* (*Epiurus*) sp.

Dustan (A. G.). **Notes on the Recovery of Onion Maggot Material from Soil Samples by Use of a Centrifuge.**—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 81–82. Toronto, 1931.

In the course of investigations on the onion maggot [*Hylemyia antiqua*, Mg.] in Ontario, a method was devised for recovering the smaller immature stages of the fly from the soil. Soil samples were immersed in a concentrated saline solution and after being stirred or shaken, were placed in a centrifuge, which was kept working for about 5 minutes at a velocity of 800 revolutions a minute. The different stages of the fly float up to the surface of the liquid and can be recovered by pouring the solution on to a $\frac{1}{4}$ millimetre mesh copper screen. As some difficulty was experienced in recovering the small, translucent first instar larvae, they were hardened and whitened, by immersing the soil samples in a weak solution of mercury bichloride before treatment. In view, however, of the corrosive nature of this solution, non-metal screens for recovering the maggots should be used.

MARSHALL (J.). **Notes on Chemotropic Responses of certain Insects.**—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 82–84. Toronto, 1931.

In the course of field investigations in Nova Scotia, preliminary to a detailed study of the influence of odours on *Rhagoletis pomonella*, Walsh, certain substances were found to be attractive to other insects. A list of these is given, together with their apparent degree of attraction and the insects attracted to them. Aniseed oil and rhodium oil both proved decidedly attractive to *Hemerophila* (*Simaëthis*) *pariana*, Cl., and the latter also to *Phorbia* (*Hylemyia*) *cilicrura*, Rond. A bait of 8 parts pollard, 1½ parts sodium borate and 100 parts water proved peculiarly attractive for about a week to Diptera, particularly Muscids, Anthomyiids and Trypetids (including *R. pomonella*) and later to Noctuids, including *Catocala* spp., and certain unidentified social wasps.

The chemicals tested were suspended in containers at a height of about 10 ft. in apple trees bearing fruit and known to have been infested by *R. pomonella* in the previous season, pure chemicals being used at the rate of 1 : 750 in water, and the others at varying concentrations according to their nature. The pans were examined twice a week during the flight period of *R. pomonella*, which extended from the beginning of July to the end of August.

KELSALL (A.) & PATTERSON (N. A.). **Experiments on the Control of the Gray-banded Leaf Roller,** *Eulia mariana* **Fern.**—*61st Ann. Rep. Ent. Soc. Ontario 1930*, pp. 84–85. Toronto, 1931.

Eulia mariana, Fern., the bionomics of which are briefly discussed [*cf. R.A.E.*, A, xvii, 92], first began to cause serious injury in apple orchards in Nova Scotia in 1925, and has since then become generally distributed in orchards in which the soil beneath the trees is not cultivated. Investigations have shown that the best time to begin spraying is when the larvae are hatching. The first application should therefore be made about ten days after the calyx spray and the second twelve days later. The sprays should be thoroughly applied to the lower surface of the leaves where the larvae are feeding at the time. In experiments 48·9 per cent. control was obtained with one application of lead arsenate (1 lb. to 40 gals. water), 75·3 with two applications of the same spray, and 84·8 with two applications of 40 per cent. nicotine sulphate (1 : 800).

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A.

*In view of the divergent opinions on the identity of the Aphids of this group, no attempt is here made to show the synonymy.

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